BEFORE THE
STATE OF NEW HAMPSHIRE
PUBLIC UTILITIES COMMISSION

Docket No. DW 20-184

IN THE MATTER OF: AQUARION WATER COMPANY OF NEW HAMPSHIRE, INC.

REQUEST FOR CHANGE IN RATES

DIRECT TESTIMONY

OF

Mark E. Ellis

On Behalf of

New Hampshire Department of Energy

March 2, 2022

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I. INTRODUCTION

Q. Please state your name, by whom you are employed, and your business address.

A. My name is Mark E. Ellis. I am a self-employed economic and financial consultant. My business address is 8595 Nottingham Place, La Jolla, CA 92037.

Q. On whose behalf are you testifying?

A. I am testifying on behalf of the State of New Hampshire Department of Energy (DOE).

Q. Please summarize your education and professional work experience.

A. I graduated from Harvard University with a Bachelor of Science in Mechanical and Materials Sciences and Engineering and from the Massachusetts Institute of Technology with a Master of Science in Technology and Policy.

I have over 25 years of professional experience in the energy industry. Before starting my consulting practice in 2020, I led the strategy function at Sempra Energy for fifteen years. My responsibilities included developing and implementing the enterprise-wide cost of capital function. Previously, I held various positions in strategy, project development, and engineering with McKinsey, ExxonMobil, Southern California Edison, and Sanyo Electric. This is my fourth utility regulatory proceeding. In 2020, I provided expert testimony on behalf of The Utility Reform Network (TURN) before the California Public Utilities Commission in PG&E's application for a $7.5-billion wildfire cost securitization. I am currently working on other cases in California and Hawaii, including a combined off-cycle

cost of capital application by California's three PUC-regulated electric utilities. Attachment MEE-1 contains more detail on my professional background.

Q. Have you previously testified before the New Hampshire Public Utilities Commission?

A. No.

Q. What is the purpose of your testimony in this proceeding?

A. I have been asked by DOE to assess the testimony of Aquarion's rate of return witness, Mr. Dylan W. D'Ascendis, and to provide an approach to estimating Aquarion's recommended capital structure and rate of return.

Q. How is your testimony organized?

A. I begin with a detailed critique of Mr. D'Ascendis's testimony. I then explain my recommended approach to determining the appropriate capital structure and ROE and conclude with my equity ratio and ROE recommendations.

A. AQUARION RATE OF RETURN TESTIMONY OVERVIEW

Q. Please provide an overview of Mr. D'Ascendis's testimony.

A. Mr. D'Ascendis's testimony consists of three main components: utility and non-utility peer group selection, capital structure, and return on equity (ROE). The latter is based on three models – the constant-growth discounted cash flow model (DCF), capital asset pricing model (CAPM), and risk premium model (RPM) – plus adjustments for flotation costs and

Aquarion's size. The RPM, in turn, is based on two additional models, referred to as the Predictive Risk Premium Model (PRPM) and the total market approach (TMA).

Q. What is your overall assessment of Mr. D'Ascendis's analysis?

A. Every component and subcomponent of Mr. D'Ascendis's analysis – proxy group selection, capital structure, and return on equity and its constituent models – is rife with errors in theory, methodology, and/or implementation, as summarized in Table 1. My testimony will begin with a detailed critique of his testimony.

Table 1. Flaws and deficiencies in Aquarion rate of return analysis

Topic	Flaw/deficiency
Proxy groups	
• Non-Price Regulated Companies (NPRC) selected on basis of comparable levered beta	• Cost of capital peers should be as similar as possible; lack of price regulation inherently makes NPRC incomparable • Premise violates fundamental risk-return correspondence principle of finance theory • Conflicts with legal standards – *Hope*: "commensurate with returns on investments in other enterprises having corresponding risks" – *Bluefield*: "at the same time and in the same general part of the country on investments in other business undertakings which are attended by corresponding risks and uncertainties" • Selection criteria – beta – includes half the market after adjusting for leverage • Logically flawed – No conceivably useful result: if NPRC has same returns as UPG, redundant; if different, model is flawed – Begs the question (assumes what must be proved) – that NPRC has same risk profile as Aquarion
Capital structure	
• Average of publicly traded UPG peers	• Simple peer comparison does not account for differences in leverage/credit rating • Peer companies have parent debt; not representative of operating company like Aquarion
Cost of debt	
• Historical average	• Incremental debt should reflect current market interest rates
Return on equity	
• Constant-growth DCF	• Assuming near-term growth rates into perpetuity demonstrably unreasonable (exceeds GDP within seven years)
• Risk premium model (RPM)	
– Predictive Risk Premium Model (PRPM)	• Pricing of all risk, not just systematic, conceptually flawed (implies holding a market cap-weighted basket of individual stocks will beat the market index) • Invalid application of short-term volatility model to estimate long-term returns • Used nowhere in finance except by model's developers and their coworkers • Zero empirical validity
– Total market approach	• Double-counted bond yield adjustments • Invalid use of beta for market-corporate bond spread • Invalid use or erroneous implementation of risk premium estimation methods (historic, low-R^2 regression, PRPM, DCF)
• Capital asset pricing model (CAPM)	• Adjusted beta not applicable to utilities • Risk premium based on historical 20-year rate inconsistent with 30-year model input • Mechanically calculated third-party betas inflated due to early 2020 market turmoil • Invalid use or erroneous implementation of risk premium estimation methods (historic, low-R^2 regression, PRPM, DCF) • Empirical CAPM not valid when using long-term risk-free rate
Adjustments	
• Small size premium	• Referenced studies all based on publicly traded companies, not subsidiaries • More recent research concludes size premium does not exist • Subsidiary small size premium is mathematically impossible (parent is weighted average of subsidiaries)
• Flotation cost	• Conceptually valid, but only when utility trades at book value • Conflicts with standalone principle
General ROE issues	
• Arithmetic returns	• Historical RPM and CAPM risk premia based on arithmetic, not geometric, returns overstate long-term return expectations
• Bond yields (RPM, CAPM)	• Forecast rates systematically upwardly biased; current rates are an unbiased predictor of future rates
• No adjustment for differences in capital structure across peer group	• Levered COEs are not directly comparable, due to differences in leverage and, therefore, risk profile • Per best practice, all COE estimates should be unlevered to 100% equity basis then relevered to target capital structure
• Duplicative use of models and data	• Analyses not independent; errors/bias compound instead of cancelling

B. RECOMMENDED APPROACH OVERVIEW

Q. What is your approach to developing your recommended equity ratio and ROE?

A. My recommended rate of return analysis has three components:

1. Proxy group (levered) cost of equity
2. Unlevered cost of equity
3. Integrated capital structure-ROE model

I will provide an overview here and more detail later in my testimony.

I estimate the proxy group members' average cost of equity (COE) using two models. The first is the multi-stage DCF model (MS DCF). This model is similar to the constant-growth DCF used by Mr. D'Ascendis, except it does not assume, unrealistically, that analysts' estimated growth rates are sustained into perpetuity. Instead, analysts' estimates are used for a few years, transitioning toward the utility sector average long-term dividend growth rate.

The second is the capital asset pricing model (CAPM). Key differences with Mr. D'Ascendis are the use of the current, not forecast, long-term risk-free rate and more reasonable long-term beta estimates. The Blue Chip Financial Forecasts used by Mr. D'Ascendis have been systematically upwardly biased for decades, and current rates are much better predictors of future rates. I develop my own beta estimates because the mechanically calculated Bloomberg and Value Line betas used by Mr. D'Ascendis have been inflated by the market turmoil in early 2020 in a manner that makes them unrepresentative of investors' current long-term expectations, and their adjustment toward 1.0 is not valid for utilities. I do not use the Empirical CAPM, because it can be demonstrated that the empirical observation upon which it is based is not valid when using a long-term risk-free rate.

Mr. D'Ascendis recognizes that "the higher the proportion of debt and preferred stock in the capital structure, the higher the financial risk to common equity owners. … Therefore, consistent with the basic financial principle of risk and return, common equity investors demand higher returns as compensation for bearing higher financial risk."[1] Nonetheless, he erroneously neglects to adjust his cost of equity estimates for differences between Aquarion's proposed capital structure and the proxy group members'. To account for these differences, I calculate each proxy group member's unlevered cost of equity, i.e., the cost of capital assuming 100% equity financing, and then relever the average using Aquarion's target capital structure. Without this process of unlevering and relevering, the peer-group average understates Aquarion's COE because their (market-based) equity ratios tend to be significantly higher than Aquarion's target capital structure.

To determine the target capital structure, I have developed an integrated model that explicitly accounts for the interactions between capital structure, ROE, and financial strength as reflected in the credit rating. This model is used to determine the optimal capital structure and ROE that minimizes customer costs while meeting the utility's target credit rating – assumed commensurate with the credit rating implied by Aquarion's proposal – and satisfying equity investors' return requirements. It is also used to estimate the potential customer savings relative to Aquarion's proposed rate of return.

Q. What is your recommended capital structure and ROE?

A. Table 2 summarizes my recommended capital structure, ROE, costs of short- and long-term debt, and weighted-average rate of return.

[1] Direct testimony of Dylan W. D'Ascendis (hereafter referred to as "DWD"), p. 11.

Table 2. Recommended rate of return summary
Percent

Capital source	Amount ($)	Weight	Cost rate	Weighted cost rate
Common equity	20,705,212	57.32	4.95	2.84
Preferred equity	2,300	0.01	6.00	0.00
Short-term debt	1,200,000	3.32	2.42	0.08
Long-term debt	14,211,714	39.35	4.62	1.82
Total	**36,119,226**	**100.00**	**4.74**	**4.74**

II. CRITIQUE OF AQUARION TESTIMONY

A. PROXY GROUPS

Q. Please explain Mr. D'Ascendis's proxy group selection.

A. Mr. D'Ascendis created two proxy groups for his analyses: a Utility Proxy Group (UPG) composed of water utility holding companies whose business profiles are similar to Aquarion's; and a comparison group of Non-Price Regulated Companies (NPRC) selected primarily on the basis of similar equity market risk (beta) characteristics.

Q. Do you endorse Mr. D'Ascendis's water utility peer selection criteria and the resulting proxy group?

A. Yes. Mr. D'Ascendis's Utility Proxy Group consists of seven publicly traded water utility holding companies. For the most part, his selection criteria appear reasonable. His analyses rely heavily on data from Value Line,[2] so inclusion in Value Line's Water Utility Industry group is a reasonable criterion. Two potential areas of concern are criteria (iv) and (vi), which require no dividend cuts in the previous five years and a positive dividend-per-share

2 Value Line is an independent investment research and financial publishing firm founded in 1931.

growth rate projection, respectively.[3] The outputs of each of his peer group analyses is based on the proxy group average, which is meant to represent the expected performance of the sector as a whole. Selectively removing poor performers would clearly bias his results, particularly the DCF method, in which the growth rate is a direct input. A review of the members of Value Line's Water Utility Industry group members reveals that these criteria did not result in the removal of any companies, although one of the eight group members, Consolidated Water, was excluded, apparently because its business is primarily outside the United States.[4]

It should be recognized that the UPG is composed of water utility holding companies, not their subsidiary utility operating companies, Aquarion's true peers. It is common for utility holding companies to hold debt not directly attributable to the operating utilities' regulated capital structure, which increases their leverage and risk.[5] These potential differences in financial profile will need to be accounted for in the cost of capital analyses.

Q. Do you endorse Mr. D'Ascendis's non-price regulated peer selection criteria and the resulting peer group?

A. No. All model results using the Non-Price Regulated Companies should be excluded from consideration.

3 DWD, p. 12.
4 As of July 9, 2021, Consolidated Water was no longer among the water utilities covered by Value Line.
5 See, for example, Moody's Investor Service, "Moody's announces completion of a periodic review of ratings of Aquarion Company," July 23, 2020; available at: https://www.moodys.com/research/Moodys-announces-completion-of-a-periodic-review-of-ratings-of--PR_428245: "Aquarion Company's (Aquarion) Baa2 rating reflects its credit profile as an intermediate holding company of low risk regulated water utilities operating in credit supportive jurisdictions in Connecticut, Massachusetts and New Hampshire; and a consolidated ratio of funds from operations (FFO) to net debt in the 8-11% range. The rating considers the substantial amount of intermediate holding company debt that is structurally subordinated compared to debt residing at its largest operating utility subsidiary, Aquarion Water Company of Connecticut (A3)."

Q. Why should all model results using the Non-Price Regulated Companies be excluded from consideration?

A. There are several reasons why the NPRC peer group should be excluded from consideration. Most generally, in selecting cost-of-capital comparison groups, finance textbooks universally recommend using *industry comparables*, firms with as many similar characteristics as possible; at a minimum, they should be in the same industry.[6] That the NPRC members are all non-utilities and not subject to price regulation makes them inherently incomparable to Aquarion.

An analogy might best illustrate the conceptual flaw with the NPRC. Suppose we wanted to develop a calorie intake recommendation for human biological males 25 to 35 years old. It would never enter our minds to base that recommendation, even in part, on data for human biological females of the same age – even if we selected only females whose weight fell within the same range as the males, akin to Mr. D'Ascendis's beta selection criterion.[7] The physiologies, activity levels, energy expenditures, body compositions, metabolisms, etc., of males and females are different enough that to include data on females to estimate male caloric needs would only introduce error, not improve the estimate.

The NPRC can be rejected from legal and financial first principles. The *Hope* standard cited by Mr. D'Ascendis – "the return to the equity owner should be commensurate with

[6] See, for example, Koller, Goedhart, Wessels, *Valuation: Measuring and Managing the Value of Companies*, 6th ed. (2015), pp. 345-46; Berk, DeMarzo, Corporate Finance, 3rd ed. (2014), pp. 414-5; Brealey, Myers, Allen, *Principles of Corporate Finance*, 10th ed. (2011), pp. 221-22.

[7] Limiting the data set based on weight, not height, is analogous to Mr. D'Ascendis's use of levered beta as his NPRC selection criterion. Levered beta is influenced by both underlying business risk and debt level, in the same way that weight is influenced by both underlying body composition (e.g., height) and calorie intake: the first is intrinsic, the second is discretionary. Just as adjusting for weight but not height would lead to a misleading calorie intake recommendation (e.g., calorie restriction for the underweight), so, too, estimating ROE based on beta without adjusting for leverage yields a misleading result. The NPRC members have relatively low levels of debt, so their unlevered betas, i.e., their underlying business risks, are substantially higher than the UPG's.

returns on investments in other enterprises having corresponding risks"[8] – is supported by finance theory, whose "basic postulate … is that assets with the same risk should have the same expected rate of return."[9] To maintain that companies with "corresponding risks" might *not* have returns commensurate with the UPG members', which must be the case for the NPRC to have any usefulness, both contradicts *Hope* and violates the most fundamental principle of finance.

The plain language of the passage in *Bluefield* cited by Mr. D'Ascendis clearly excludes the NPRC as a basis of comparison:[10]

> A public utility is entitled to such rates as will permit it to earn a return on the value of the property which it employs for the convenience of the public equal to that generally being made *at the same time and in the same general part of the country on investments in other business undertakings which are attended by corresponding risks and uncertainties*, but it has no constitutional right to such profits as are realized or anticipated in highly profitable enterprises or speculative ventures. [emphasis added].

The NPRC includes companies like Adobe, salesforce.com, Standard Motor Products, and J. M. Smucker – enterprises that in no way could be considered to be investing in "business undertakings … attended by corresponding risks and uncertainties," much less "at the same time and in the same general part of the country," as a small regional water distribution utility in New Hampshire. Given these companies' lack of monopoly power and exposure to market competition, they are also significantly more speculative.

The NPRC fails in its methodology, as well. The key criterion for inclusion is an unadjusted beta between 0.45 and 0.75.[11] Beta is a measure of equity market risk and an

[8] Data request response DOE 5-16 Attachment 1, p. 2 (Attachment MEE-2).
[9] Modigliani, Pogue, "An Introduction to Risk and Return: Concepts and Evidence," *Financial Analysts Journal*, 30:3 (May-June 1974), p. 69.
[10] DWD, p. 41; data request response DOE 5-16 Attachment 2, p. 1 (Attachment MEE-3).
[11] DWD, pp. 35-36. As explained below, equity betas are often adjusted for their tendency, on average, to trend toward the market average of 1.0 over time.

input in the CAPM. As explained further below, a key step in using the CAPM to estimate a target company's cost of equity is to adjust for differences in leverage (share of debt in the capital structure).[12] When the NPRC members' betas are adjusted for leverage, the range increases to 0.30-0.75 – wide enough to include the unlevered betas of roughly half the companies in the US.[13] A peer group that large does not provide any basis for a meaningful comparison.

The NPRC can also be rejected on purely logical grounds. Since risk and its relationship to the cost of capital cannot be precisely measured, the only way to know whether a dissimilar peer group has the same risk profile as the more similar peers is to compare their estimated returns. To the extent they are the same, though, the dissimilar peer group is redundant; to the extent they differ, it can only be concluded that the less similar group does not have the same risk profile as the more similar group. While it is *possible* for assets with the same risk to have different returns (in contradiction to finance theory and the *Hope* standard), Mr. D'Ascendis provides no evidence to support such an assertion. Mr. D'Ascendis is committing the logical fallacy of begging the question – assuming what first must be proven.

Finally, as will be explained further below, his implementations of the discounted cash flow, risk premium, and capital asset pricing models used to estimate the NPRC's COE are

[12] See, for example, Koller, et al, *Valuation*, 6th ed., pp. 286-87: "Simply using the median of an industry's raw regression betas, however, overlooks an important factor: leverage. A company's beta is a function of not only its operating risk, but also the financial risk it takes. Shareholders of a company with more debt face greater risks, and this increase is reflected in beta. Therefore, to compare companies with similar operating risks, you must first strip out the effect of leverage. Only then can you compare betas across an industry." Note the implied assumption that betas are only compared across a *single* industry, not across multiple industries.

[13] M. Ellis analysis using DWD betas, market capitalization and enterprise value from Yahoo! Finance as of April 6, 2021, and industry betas from NYU finance professor Aswath Damodaran (https://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/Betas.html).

flawed in numerous ways. Even if the NPRC were conceptually sound, the results would not be valid.

B. CAPITAL STRUCTURE

Q. Please explain how Mr. D'Ascendis arrives at his capital structure recommendation.

A. Mr. D'Ascendis recommends Aquarion maintain its current capital structure, citing in support the UPG's average debt and preferred and common stock ratios. As described above, these holding companies can have different risk profiles than their subsidiary utility operating companies, due to differences in leverage. Consequently, while the Utility Proxy Group average can provide a helpful comparison, it does not necessarily indicate the appropriate capital structure for Aquarion's business and financial profile.

Q. How should the capital structure be determined?

A. The appropriate capital structure can be determined more rigorously by using the analytical methods employed by credit rating agencies. Water utility operating companies typically have S&P/Moody's credit ratings between A-/A3 and A+/A1.[14] This range is assumed to be the credit quality target for Aquarion.

[14] See, for example, Attachment DWD-4, p. 5, which lists the credit rating of several water utility operating companies.

Q. How is the capital structure determined from the target credit rating?

A. In determining credit quality, credit rating agencies primarily consider three financial ratios: debt to capitalization (D/C), funds from operations – net income plus depreciation, amortization, and deferred taxes – to debt (FFO/D), and FFO interest coverage (IC).[15]

Moody's provides sufficient detail on their methodology to calculate the credit rating for any given combination of D/C, FFO/D, and IC metrics, as shown in Table 3. Two of the metrics incorporate FFO. FFO is based on net income, i.e., ROE, so credit rating will vary with ROE. Given a target credit rating and ROE, we can work backward from the corresponding credit metrics to the required capital structure.

[15] See, for example, Moody's Investors Service, "Rating Methodology: Regulated Water Utilities" (June 2018), p. 21; available at: https://www.moodys.com/researchdocumentcontentpage.aspx?docid=PBC_1121971. FFO interest coverage is the ratio (FFO + interest)/interest. Moody's methodology includes a fourth financial metric, retained cash flow after dividend payments, with a much lower weighting than these three. Aquarion does not appear to have a consistent dividend policy, ranging from -10% to 100% over 2007 to 2020, so this metric is ignored in this analysis.

Table 3. Moody's credit rating financial metrics[16]

Factor 3 – Leverage and Coverage (40%)

The following tables show the scorecard-scoring categories for each Leverage and Coverage sub-factor and the weighting thereof.

Rating Factor	Weight	Aaa	Aa	A	Baa	Ba	B	Caa
Adjusted Interest Coverage Ratio (1)	12.5%	≥8x	4.5-8x	2.5-4.5x	1.5-2.5x	1.2-1.5x	1-1.2x	<1x
OR		OR	OR	OR	OR	OR	OR	OR
FFO Interest Coverage (2)		≥10x	7-10x	4.5-7x	2.5-4.5x	1.8-2.5x	1.5-1.8x	<1.5x
Net Debt / Regulated Asset Base (3)	10%	<25%	25-40%	40-55%	55-70%	70-85%	85-100%	≥100%
OR								
Debt / Capitalisation								
FFO / Net Debt	12.5%	≥40%	25-40%	15-25%	10-15%	6-10%	4-6%	<4%
RCF / Net Debt	5%	≥30%	20-30%	10-20%	6-10%	4-6%	2-4%	<2%

Notes:

(1) The Adjusted Interest Coverage Ratio is our preferred metric for water utilities where allowed revenues/tariffs are determined using a 'building block' or equivalent approach and where the components of allowed revenues/tariffs are consistently available and can be verified by from an independent source – in many cases, publications from the regulatory authority itself. For the numerator, Interest net of Inflation Accretion is added back to the extent it was deducted in calculating FFO. Capital Charges represent expenditures recovered in revenues that are not accounted for as operating expenses and are not treated as additional invested capital incrementing the RAB, including regulatory revenue profiling to smooth the impact of tariff increases on customer bills.

(2) In jurisdictions where regulatory revenues/tariffs are not determined with a 'building block approach' or where the regulatory information needed to calculate Capital Charges may not be consistently available, we use the FFO Interest Coverage, calculated (or for forward periods estimated) as (FFO + Interest Expense) / Interest Expense.

(3) For the utilities regulated under a RAB-based model where the RAB accurately represents the invested capital on which the water utility will earn a return over time, we measure leverage as Net Debt to RAB. For water utilities that (1) are regulated under tariff models without a RAB; (2) are regulated under a RAB-based model but where the RAB may not accurately represent the invested capital on which the water utility will earn a return over time (e.g. because of ex-post rate-setting); or (3) where RAB may not be consistently available, we use Debt to Capitalisation.

Q. How do ROE, equity ratio, and credit rating interact?

A. Figure 1 illustrates the relationship between ROE, equity ratio, and credit rating based on data from Aquarion's proforma financial statements in Table 4. Aquarion's proposed ROE of 10.25% is represented by the thick black line in the figure. At Aquarion's current cost of debt, 5.84%, the marginal return on rate base (RORB), grossed up for taxes (27.1%)[17] – i.e., the cost of capital ultimately borne by customers – is 10.14%. Combined with the proposed

[16] Moody's Investors Service, "Rating Methodology: Regulated Water Utilities" (June 2018), p. 21; available at: https://www.moodys.com/researchdocumentcontentpage.aspx?docid=PBC_1121971.

[17] Schedule No. A, line 13.

equity ratio of 52.36%, Aquarion's credit rating, based on its financial metrics alone, would be between A-/A3 and A/A2.[18]

Figure 1. Relationship between ROE, equity ratio, ROE, credit rating[19]

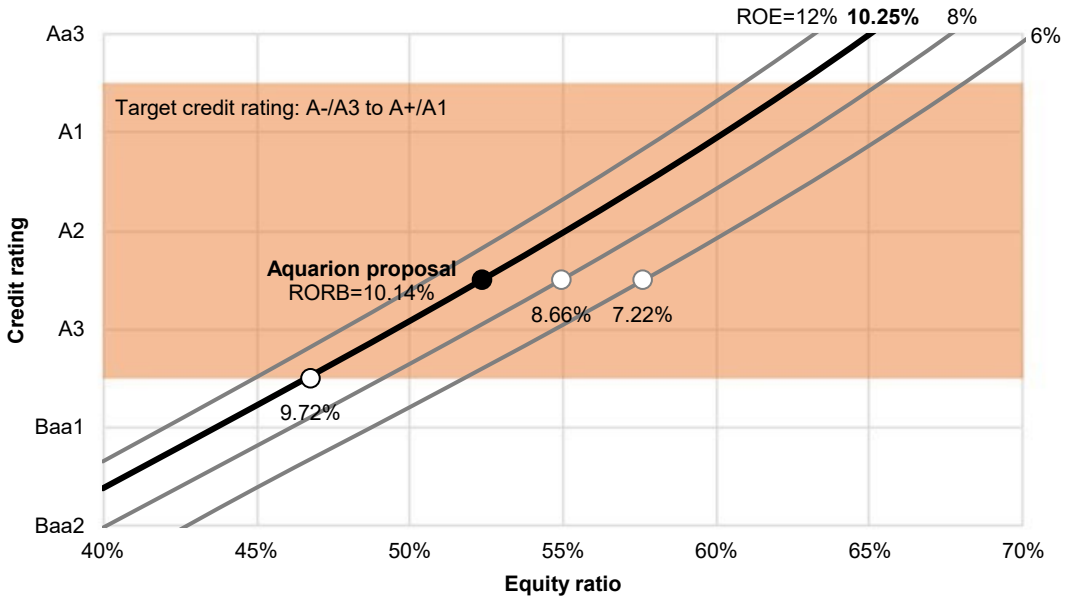


Table 4. Selected Aquarion proforma financial data[20]
$ thousand

Rate base	Net income	Depreciation	Deferred taxes	Funds from operations
36,119	1,938	1,311	92	3,342

A lower ROE requires more equity to maintain the same credit rating. Generally, at typical water utility target credit ratings, savings from a lower ROE, even after grossing-up for taxes, more than make up for the incremental total cost of the additional equity required in the capital structure. For example, at the A2/A3 credit rating implied by Aquarion's

[18] For brevity, hereafter, credit ratings will be given only on Moody's scale.
[19] For apples-to-apples comparison with Aquarion's proposal, this analysis assumes Aquarion's average cost of existing debt. The recommended capital structure and cost of capital will assume a cost of any incremental debt commensurate with Aquarion's credit quality, current market rates, and typical financing costs.
[20] Rate base: Schedule A, p.1; depreciation and deferred taxes: Schedule No. 1, p. 2; income: 10.25% x 52.36% equity ratio x $36,119,226 rate base = $1,938,483

proposal, an 8% ROE requires more equity, 54.9%, but the marginal pre-tax RORB is 8.66%, a savings of 15%. A 6% ROE requires 57.6% equity, but the 7.22% RORB saves 29%.

Many observers see utilities' healthy credit ratings and low cost of debt and conclude that the best way to reduce customer costs is to increase the amount of debt in the capital structure. For example, moving down one full credit grade, to the lowest end of the A3 band, at Aquarion's proposed 10.25% ROE the equity ratio can be as low as 46.8%. After adjusting for the higher cost of debt – 0.07%, the estimated current spread between the low ends of A2- and A3-rated public utility debt (see below) – RORB drops only 4%, to 9.72%. This analysis suggests that, rather than "lever up," it is much more effective to reduce ROE, provided it covers the true cost of equity, even if it requires more equity in the capital structure.

Q. What other factors influence the credit rating?

A. These three financial ratios – D/C, FFO/D, IC – account for approximately 35% of the total credit rating.[21] The other main factors are business profile, financial policy, and potential support from corporate parent(s). While Aquarion is considered a "low-risk regulated water utilit[y] operating in [a] credit supportive jurisdiction,"[22] and its immediate and ultimate parents, Aquarion Company and Eversource, could support its credit, these factors are difficult to quantify because of their potential interaction with the various financial ratios. It is therefore conservatively assumed that Aquarion's credit rating is determined solely by these three ratios, with no benefit from any other potential credit supportive factors.

[21] Retained cash flow has a weighting of 5%.
[22] Moody's Investors Services, "Moody's announces completion of a periodic review of ratings of Aquarion Company" (June 29, 2021); available at: https://www.moodys.com/research/Moodys-announces-completion-of-a-periodic-review-of-ratings-of--PR_444592.

Q. What capital structure do you recommend?

A. Because the capital structure cannot be determined independently of ROE, I will revisit it later in my testimony after estimating Aquarion's unlevered cost of capital.

C. COST OF DEBT

Q. How does Mr. D'Ascendis determine the cost of debt?

A. Mr. D'Ascendis uses Aquarion's current short- and long-term cost rates, grossed-up for financing costs, 2.42% and 6.14%, respectively.

Q. Are these rates appropriate?

A. Aquarion's short-term debt is intercompany,[23] and the interest rate has presumably been determined on an arm's length basis, per IRS guidelines.

Aquarion's current long-term debt is $13.9 million, which combined with its $1.2 million of short-term debt, sums to $15.1 million, or 41.8% of rate base. Aquarion's proposed debt ratio is 47.63%.[24] Aquarion would therefore need to issue $2.1 million of additional debt. Additionally, according to Aquarion's 2020 annual report, $5.0 million and $3.0 million of its current long-term debt will mature by July 2022 and June 2023, respectively.[25]

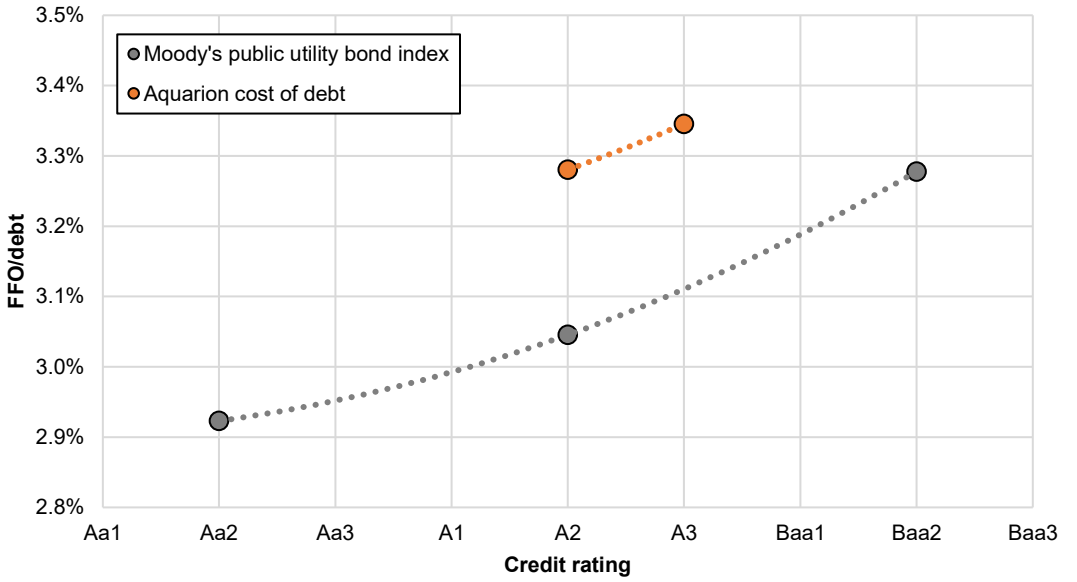
Aquarion's current average cost of long-term debt is 6.14%, reflecting the higher interest rates that prevailed at the time of its issuance, in 1993, 2005, and 2012. In the current lower-rate environment, any new debt will have a lower rate, which should be reflected in the average cost of debt.

[23] Schedule No. 4E.
[24] 1 – 52.36% common equity – 0.006% preferred equity.
[25] "Annual Report of Aquarion Water Company of New Hampshire, Year ended December 31, 2020," p. 51.

Q. How should the cost of new debt be determined?

A. The cost of new debt should reflect Aquarion's credit quality, current market rates, and expected financing costs. Figure 2 shows the relationship between credit rating and the current cost of public utility debt.[26] Assuming a credit rating between A2 and A3, Aquarion's current cost of debt, grossed-up 0.23% for financing costs,[27] is between 3.28% and 3.35%.

Figure 2. Aquarion cost of new debt[28]
December 2021



The average cost of debt will depend on the recommended capital structure and target credit rating, which I will discuss later in my recommended approach.

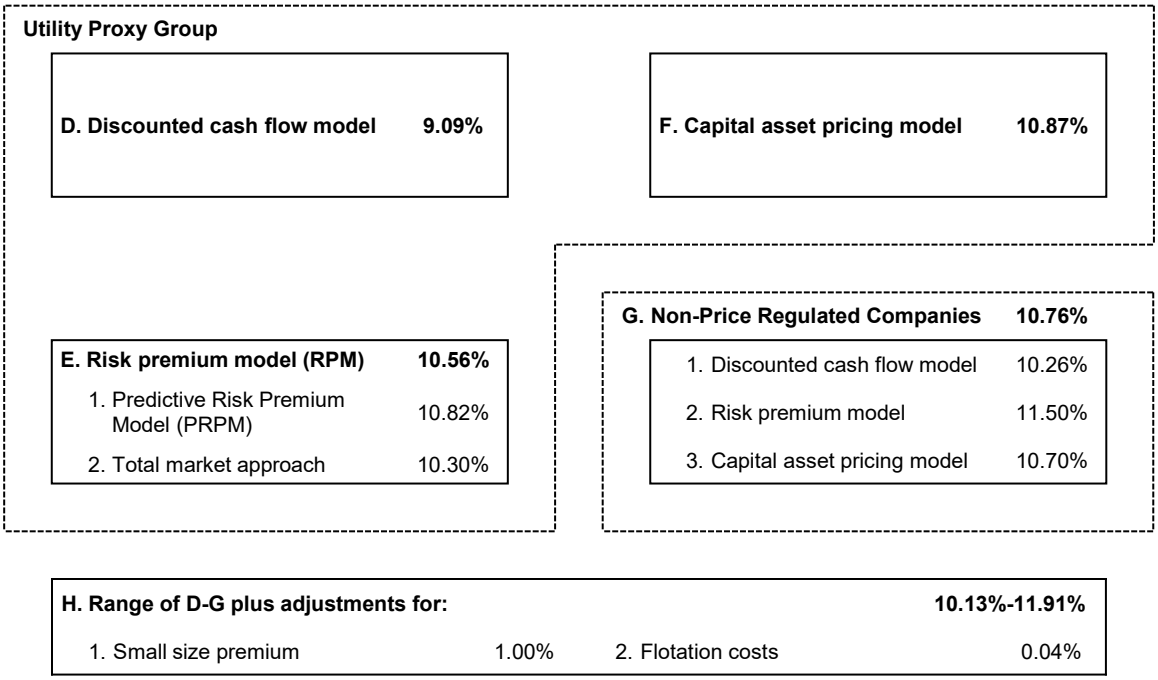
[26] The interest rate relationship is estimated by fitting a binomial regression line to the December 2021 monthly average Moody's Aa-, A-, and Baa-rated public utility bond yields.
[27] Schedule No. 4D. Difference between weighted average coupon (5.90%) and cost (6.14%) rates.
[28] December 2021 daily average. Moody's via S&P Global Market Intelligence.

D. AQUARION ROE CALCULATION OVERVIEW

Q. Please provide an overview of how Mr. D'Ascendis calculates Aquarion's ROE.

A. Mr. D'Ascendis's ROE calculation is based on three models: DCF, CAPM, and RPM. The RPM, in turn, is based on two additional models, referred to as the "Predictive Risk Premium Model" (PRPM) and "total market approach" (TMA). He adjusts his model results for Aquarion's size and its parent's flotation costs before arriving at his final recommendation. Figure 3 provides a high-level overview of Mr. D'Ascendis's methodology and results.

Figure 3. D'Ascendis ROE calculation methodology overview



E. DCF MODEL

Q. Which version of the DCF model does Mr. D'Ascendis use?

A. Mr. D'Ascendis uses the constant-growth DCF (CG DCF), which assumes a single, constant rate of cash flow growth. It is based on the well-known and widely used mathematical

formula for the value of a growing perpetuity stream of cash flows. Here, the cash flows are expected dividends, and the perpetuity value formula can be expressed as:

$$M_0 = D_0 \frac{(1+g)}{(k-g)}$$

where M_0 refers to the current market value (stock price), D_0, the current dividend (typically four times the most recent quarterly payment), g, the forecast perpetuity growth rate, and k, the cost of equity. Rearranging terms, the cost of equity can be expressed as a function of the dividend yield, d ($\frac{M_0}{D_0}$), and growth rate:

$$k = d(1+g) + g$$

In some implementations of the CG DCF, the first-year dividend yield is calculated by multiplying the current yield by $1 + \frac{g}{2}$, instead of $1 + g$, to account for the quarterly, not annual, payment of dividends. Mr. D'Ascendis uses this approach.[29] Typically, the cost of equity is estimated for each member of the proxy group, with the mean or median reflecting the cost of equity for the target company. Mr. D'Ascendis uses the average of the mean and median for the final result of his DCF and other models.

The DCF model is a particularly apt representation of stock returns because its assumptions realistically reflect several key features of share prices and expected returns. First, the DCF model's perpetual cash flow stream assumption mirrors equity's claim on a firm's cash flows into perpetuity. Second, the assumption of steady growth in dividends reasonably reflects their much greater stability relative to other potential measures of profitability, like earnings or cash flow. Third, the resulting single discount rate into

[29] It can be demonstrated mathematically that, for dividend yields as of the starting time period of the model (t_0), the common method of using four times the most recent quarterly dividend is already slightly conservative, and this adjustment is therefore not necessary. While widely used, the origin of the $1 + \frac{g}{2}$ adjustment is not known.

perpetuity is consistent with the no-arbitrage principle of finance. If investors expected higher (lower) returns in the future, they would impute that into the price today and bid up (down) the price accordingly, such that near-term and long-term returns roughly equilibrate.[30]

It should be noted that the DCF model yields a *geometric* average return, or the fixed annual rate of return on M_0 that, if compounded every year, would have the same value over time as the sum of the DCF model's past and future streams of dividends, compounded (past) and discounted (future) at the same rate.

Q. Why is that clarification important?

A. When analyzing investment returns, another commonly reported average is the *arithmetic* average: the simple, unweighted average of returns across multiple historical holding periods (e.g., the average of monthly or annual returns over multiple years). A simple example illustrates the difference. Suppose a stock price increases by 50% in one year, then declines by 50% the following year, such that the ending value is 75% of the starting value. The arithmetic average is 0%, (+50% – 50%)/2, while the geometric average is -13.3%, $[(1 + 50\%) \times (1 - 50\%)]^{1/2} - 1$.

[30] Some equity return projections vary with forecast horizon. This is generally due to a valuation-reversion assumption in the model, e.g., price-to-earnings ratios returning to their long-term historical average over an initial horizon and remaining at that level afterward. See, for example, BlackRock's capital market assumptions, available at: https://www.blackrock.com/institutions/en-us/insights/charts/capital-market-assumptions. Whether variation in expected equity returns across different forecast horizons can be estimated with any accuracy is a subject of ongoing debate among academic and investment professionals. Some forecasters assume no mean reversion in their return forecasts. See, for example, AQR Capital Management, "2014 Capital Market Assumptions for Major Asset Classes" (1Q 2014); available at: https://www.aqr.com/Insights/Research/Alternative-Thinking/2014-Capital-Market-Assumptions-for-Major-Asset-Classes.

Returns can be reported on either basis, depending on the context, but investors are not indifferent between them. Investors care most about changes in asset values over time, and only the geometric return provides an unambiguous indicator of this change. Given a starting investment value, for any geometric return there is a single future value, but for any arithmetic return there are an infinite number of potential future values. If the geometric average return is 5%, for example, in two years the value will be 1.05 x 1.05 – 1 = 1.1025. In contrast, if the arithmetic return is 5%, in two years the value could be anywhere from 0, (1 + 110%) x (1 – 100%), to 1.1025 if the return is the same 5% in each year. The arithmetic return, on its own, does not indicate the future value and, unless it does not vary from year to year, systematically overstates it.

For this reason, geometric returns are generally considered a better measure of investor expectations. I will return to this topic later in my testimony in the discussion of the CAPM.

Q. How does Mr. D'Ascendis calculate the current dividend yield?

A. To calculate the dividend yield, Mr. D'Ascendis divides four times the most recent quarterly dividend by the average share price over the preceding 60 trading days, or approximately three months. While it is advisable to use a multi-day average of the share price to reduce the effect of any day-to-day price fluctuations that are not reflective of investors' long-term expectations, Mr. D'Ascendis's is unnecessarily long. Because share prices have a general tendency to trend upward over time, the longer the backward-looking averaging period, the lower the share price will tend to be, introducing upward bias in the dividend yield. Averaging over a more reasonable 20 trading days (roughly one month), would increase the

share prices of the UPG by 3.9% and reduce the average dividend yield from 1.82% to 1.74%.

Q. How does Mr. D'Ascendis estimate each utility's perpetuity growth rate?

A. While estimating the current dividend yield is fairly straightforward (although, as just explained, there is scope for bias even there), estimating the perpetuity growth rate is more subjective. Mr. D'Ascendis uses analysts' consensus three-to-five-year estimated earnings-per-share (EPS) growth rate.[31] The DCF is a model of dividends, not earnings, so it would be preferable to use explicit dividend forecasts. While some analysts, such as Value Line, do provide dividend forecasts, they are less common. It is generally assumed that, over the long term, dividends and earnings grow at the same rate.[32]

Q. Is it reasonable to assume analysts' consensus growth rates into perpetuity?

A. No. There are several problems with using analysts' estimates for the perpetuity growth rate. A wealth of academic research has found that analyst forecasts tend to be optimistic.[33] The CG DCF model is based on the formula for a growing perpetuity, so the growth rate must reflect growth into perpetuity, but analysts' estimates look out only three to five years.

[31] The sources used by Mr. D'Ascendis use the following forecast horizons, per their respective websites: Value Line: '17-'19 to '23-'25; Zack's: 3 to 5 years; Yahoo! Finance: next 5 years; Bloomberg: next five years. An additional concern with analysts' estimates is that the starting time period is usually unknown. In the rare instances where it is known, it is virtually certain not to be coincident with the starting time period assumed in the DCF model, i.e., the end of the last trading day of the share price averaging period. Value Line's starting period, for example, is '17-'19, at least a year stale at the time of Mr. D'Ascendis's calculations.

[32] Although there is substantial documentation of analyst bias, their estimates tend to be better predictors of future dividend growth than future earnings growth.

[33] See, for example, Goedhart, Raj, Saxena, "Equity analysts: Still too bullish," *McKinsey Quarterly* (April 2010); available at: https://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/equity-analysts-still-too-bullish). For a more recent example, see Cassella, Golez, Gulen, Kelly, "Horizon Bias and the Term Structure of Equity Returns" (2020); available at: https://ssrn.com/abstract=3328970).

Several observations and analyses demonstrate the unreasonableness of using analysts' estimates for the perpetuity growth rate in the constant-growth DCF model.

Incompatible forecast horizon

One concern with analysts' estimates is that the starting time period is not specified with precision. S&P explains of its estimates:[34]

> Long Term Growth Rate (LTG) is a compound annual growth rate based on current and projected EPS values provided directly by the analysts. … Most analysts define LTG as an estimated average rate of earnings growth for the next 3-5 years. The exact time frame differs from broker to broker. Since the analysts providing LTG may differ from the analysts providing fiscal year estimates and the variation in time periods of 3-5 years, it is not possible to reconcile LTG with fiscal year estimates.

The starting point for Yahoo! Finance's estimates is similarly unknown:[35]

> [A]s most analysts do not provide the basis of the calculation of their growth rates, the estimates collected are assumed to include a combination of past and future years with at least one future period included, and are calculated on a compounded annual growth rate (CAGR) basis.

Value Line is one source of estimates that does specify the starting point and forecast horizon for its estimates. Even then, they are virtually certain not to be coincident with the starting time period assumed in the DCF model, i.e., the end of the last trading day of the share price averaging period. Value Line's starting period for the UPG members, for example, is '17-'19, at least a year stale at the time of Mr. D'Ascendis's calculations.[36]

[34] Via YCharts website, which reports estimates provided by S&P; available at: https://ycharts.com/glossary/terms/eps_est_long_term_growth.
[35] Via Stockopedia website; available at: https://www.stockopedia.com/ratios/long-term-growth-forecast-5107/. The passage refers to Reuters, now Refinitiv, the source of Yahoo! Finance's estimates; see: https://help.yahoo.com/kb/finance-for-web/SLN2310.html.
[36] Attachment DWD-3, pp. 2-8.

Earnings can vary significantly from one year to the next. Without knowing the forecast period, it is not possible to determine whether the growth rate reflects a long-term sustainable rate. Following a year of poor performance, for example, expected growth would be elevated, potentially significantly above what could be sustained long-term.

Inconsistency with analysts' own forecasts

In addition to their EPS growth rates, Value Line publishes a variety of other forecasts, including for share prices and dividends.[37] These forecasts can be used to estimate Value Line's own expected return for each company.[38] Table 5 shows the relevant data for the Utility Proxy Group, the CG DCF model results, and Value Line's own implied return. The DCF results are consistently higher than Value Line's implied returns, by 4.16% on average.[39]

Table 5. Value Line constant-growth DCF vs. implied COE for Utility Proxy Group[40]
As of October 2020

	'17-'19			3-to-5-year growth (%)		'23-'25	Estimated COE (%)		
Water utility company	Price	Dividend	Yield (%)	EPS	DPS	**price**	CG DCF	Value Line	DCF–VL
American States Water	61.74	1.07	1.73	6.5	9.5	68.15	8.35	3.95	4.39
American Water Works	93.10	1.79	1.92	8.5	8.5	115.15	10.58	5.94	4.64
California Water	43.45	0.75	1.73	6.5	5.5	46.00	8.35	3.00	5.35
Essential Utilities	36.41	0.85	2.33	7.0	7.5	47.25	9.50	7.14	2.36
Middlesex Water	47.47	0.92	1.93	6.0	5.5	57.50	8.05	5.40	2.65
SJW Group	59.27	1.12	1.89	10.5	7.0	80.30	12.59	7.30	5.29
York Water	34.66	0.67	1.94	7.0	6.0	40.00	9.08	4.66	4.42
Mean							**9.50**	**5.34**	**4.16**

[37] Value Line reports do not include actual share price forecasts, but EPS and price-earnings multiple (P/E) forecasts. Price can be calculated by multiplying these two figures: P = EPS x P/E.

[38] A simple DCF model can be constructed where the initial investment is the '17-'19 price, dividends through '23-'25 are forecast from the current dividend escalated at the dividend growth rate, and the terminal value is the '23-'25 price. The expected return is the internal rate of return (IRR) of this cash flow stream.

[39] It might be argued that Value Line's return forecast is only for the period through '23-'25 and that returns afterward will be higher, such that the combined return is equal to the CG DCF result. This conflicts with our understanding of markets. Because equities are a claim on future cash flows into perpetuity, if investors expect higher returns in the future, they will impute that into the price today and bid up the price accordingly, such that near-term and long-term returns equilibrate.

[40] M. Ellis analysis based on Attachment DWD-3, pp. 2-8.

Inconsistency with historical growth

Analyst earnings (and, by assumption, dividend) growth forecasts tend to be higher than the companies' long-term historical results. Table 6 compares the Utility Proxy Group members' growth forecasts to their historical 27-year (1993-2020) EPS and dividend-per-share (DPS) compound average growth rates (CAGR). On average, the forecast rate is 1.7% higher for earnings and 3.4% higher for dividends. The difference is even greater when adjusted for inflation. At the time of Mr. D'Ascendis's analysis, September 2020, forecast long-term inflation, as indicated by the one-month trailing 30-year Treasury-TIPS spread, was 1.76%.[41] In contrast, historical inflation over the 27 years from 1993 to 2020 averaged 2.18%. Forecast real dividend growth is 2.1%-3.8% higher than the Utility Proxy Group's historical performance.

Table 6. Utility Proxy Group earnings and dividend growth rates[42]
Percent, as of September 30, 2020

	Forecast EPS/DPS growth rate		27-year historical growth rate			
			Nominal		Real (2.18 inflation)	
Water utility company	Nominal	Real (1.76 inflation)	EPSs	DPS	EPS	DPS
American States Water	5.68	3.85	8.33	4.40	6.01	2.17
American Water Works	8.23	6.36	4.65	2.88	2.41	0.68
California Water	9.00	7.11	3.96	2.14	1.74	-0.04
Essential Utilities	6.55	4.71	6.72	6.80	4.44	4.52
Middlesex Water	4.35	2.55	4.48	2.67	2.25	0.48
SJW Group	11.40	9.47	6.05	5.03	3.79	2.79
York Water	5.95	4.12	4.95	3.35	2.71	1.14
Mean	**7.31**	**5.45**	**5.59**	**3.90**	**3.34**	**1.68**
Forecast – history			1.72	3.41	2.12	3.78

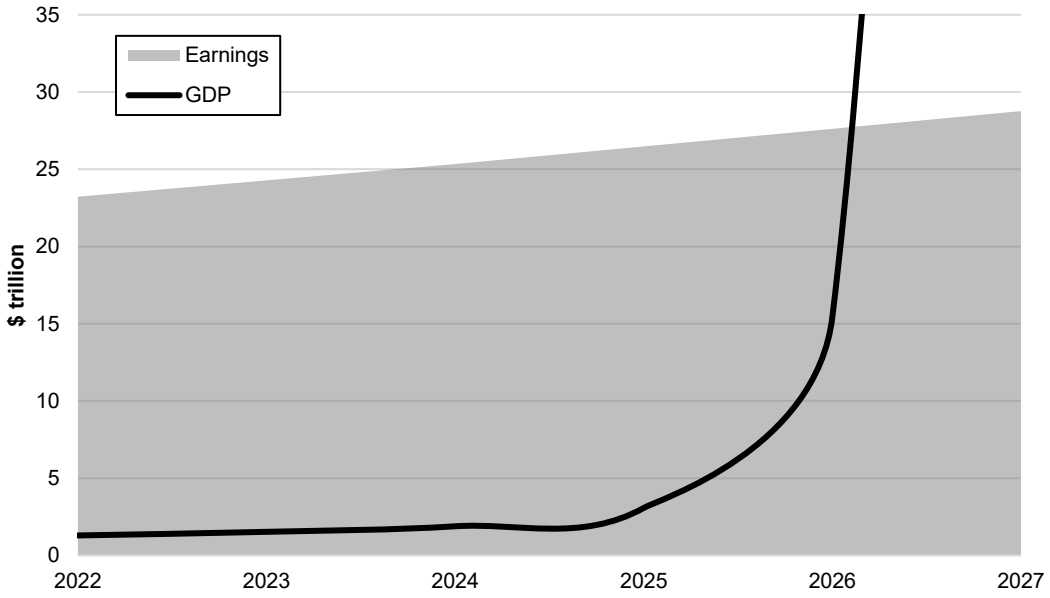
[41] Federal Reserve Bank of St. Louis Economic Data (FRED); available at: https://fred.stlouisfed.org/series/T30YIEM.

[42] M. Ellis analysis based on data from Attachment DWD-3, p. 1 (forecast growth rate); Wolfram Alpha, Yahoo Finance, and company SEC filings (historical EPS and DPS); BLS (historical inflation); St. Louis Fed (forecast inflation).

Economic impossibility

It is economically impossible for analysts' forecast growth rates to be sustained even one decade, much less into perpetuity. Figure 4 compares the forecast aggregate earnings of the US publicly traded companies for which analysts provide EPS growth forecasts to forecast US GDP.[43] Currently, these companies' combined earnings are equal to roughly 6% of US GDP. Yet if analysts' growth projections are correct, they will exceed total US GDP in just five years.[44]

Figure 4. US stock market forecast earnings vs. GDP[45]



[43] M. Ellis analysis of S&P GMI data for 972 stocks. Excludes companies with growth rates less than -100%.

[44] Sum of the forecasts for each company. Analysts' EPS estimates and growth rates from S&P Global Market Intelligence, as of December 31, 2021. GDP forecast is average of Congressional Budget Office, "The 2021 Long-Term Budget Outlook" (March 4, 2021), available at: https://www.cbo.gov/publication/56977; Energy Information Administration, "Annual Energy Outlook 2021," Table 20. Macroeconomic Indicators (February 3, 2021), available at https://www.eia.gov/outlooks/aeo/tables_ref.php; Social Security Administration, "The 2021 Annual Report of the Board of Trustees of the Federal Old-Age and Survivors Insurance and Federal Disability Insurance Trust Funds," Supplemental Single-Year Tables, (August 31, 2021), available at: https://www.ssa.gov/OACT/TR/2021/.

[45] Average of CBO, EIA, SSA nominal GDP forecasts. S&P GMI data for 972 stocks, as of December 31, 2021. Excludes companies with growth rates less than -100%.

Given their incompatible forecast horizons, inconsistency with analysts' own return forecasts and historical growth, and economic impossibility, it is unreasonable to use analysts' estimates for the perpetuity growth rate assumption in a constant-growth DCF model.

Q. Do you have any other concerns about Mr. D'Ascendis's implementation of the DCF model?

A. Yes. I have two additional concerns. The UPG members were selected on the basis of the similarity of their risk profiles to Aquarion's, and to each other's. They therefore should be expected to have similar costs of capital. Mr. D'Ascendis's DCF model results vary by a factor of over 2, from 5.97% to 13.55%. This is a clear indication that the model is poorly specified for its intended purpose.

Second, the DCF model produces an expected return on a company's equity. The UPG companies have different capital structures than Aquarion, so their equity risk profiles vary as well. The DCF model results need to be adjusted for differences in leverage among the UPG members, and between the UPG and Aquarion. This will be revisited later in my testimony when I discuss my recommended approach.

Q. Given the numerous shortcomings of the DCF model that you have identified, should it be used at all?

A. Discounted cash flow models are a robust approach to estimating expected returns and are widely used throughout finance. The key shortcoming of the constant-growth version of the DCF model used by Mr. D'Ascendis – assuming a relatively short-term growth rate into

perpetuity – can be easily remedied by assuming that analysts' estimated growth rates apply only for a limited period, after which they converge toward a market- or sector-average terminal growth rate in a multi-stage DCF model (MS DCF). Despite the various deficiencies in analysts' estimates even in the short-term, they are widely viewed as the best available estimates of near-term investor expectations. That said, relatively little weight should be placed on them in estimating the cost of equity, and the MS DCF model weights them more appropriately. I will discuss the MS DCF model in more detail when I cover my recommended approach.

F. RISK PREMIUM MODEL

Q. Please provide an overview of Mr. D'Ascendis's risk premium model.

A. Mr. D'Ascendis's risk premium model (RPM) is actually a composite of several different models, all based on the concept of adding a premium to a low- or no-risk interest rate as investor compensation for assuming risk. His RPM result is a complicated average of the results of multiple subordinate analyses, summarized in Table 7. While the risk premium model might be sound in concept, the various versions included in Mr. D'Ascendis's testimony are (1) ill-suited to estimating the long-term expected returns that are the goal of the ROE analysis; (2) suffer from various errors in implementation; and/or (3) duplicative with the more widely used capital asset pricing model (CAPM).

Table 7. Constituent risk premium model analyses
Percent

Model	Description/data				Result
1. Predictive Risk Premium Model (PRPM)	Forecast 30-year Treasury yield + GARCH risk premium				**10.82**
	Forecast 30-year Treasury yield				2.11
	+ UPG average of GARCH (generalized autoregressive conditional heteroskedasticity) statistical risk premium model				8.71
2. Total market approach	Adjusted Aaa bond yield + risk premium				**10.30**
a. Adjusted bond yield	Forecast Moody's Aaa bond yield			2.96	3.56
	+ historical A2-Aaa premium			0.54	
	+ historical UPG-A2 premium			0.06	
Equity risk premium (f x average of b-e)	Large-cap Beta x (total market – Moody's Aaa/Aa2 corporate bond yield)	7.72	Utility Utility index – Moody's A2 utility bond yield	5.75	6.74
b. Historical average	Large company stocks	5.78	S&P Utility Index	4.21	
c. Regression		9.42		6.88	
d. PRPM		9.54		5.53	
e. DCF (forecast sources)	Value Line Summary and Index	10.73	NA		
	Value Line S&P 500 Index	10.99	Value Line S&P Utility Index	6.68	
	Bloomberg S&P 500 Index	10.74	Bloomberg S&P Utility Index	5.44	
f. Beta	Average of Value Line/Bloomberg	0.81	NA	NA	

1. Predictive Risk Premium Model

Q. What is the Predictive Risk Premium Model?

A. For one of his methods of calculating the risk premium, Mr. D'Ascendis introduces a proprietary methodology, the Predictive Risk Premium Model (PRPM). This approach, developed by Mr. D'Ascendis and several senior executives at his previous employer, Associated Utilities Services (AUS), uses a statistical modeling technique known as generalized autoregressive conditional heteroskedasticity (GARCH).

Estimating the expected return on equity has been the focus of intense and extensive research and analysis by academics and investment professionals for many decades, over which time a number of generally accepted practices have been developed and become widely used. The introduction of a new method like the PRPM inevitably raises a number of questions.

Q. What questions does it raise?

A. Several come to mind, including:

- What underlying equity risk factors does the model use to estimate returns?
- Is the method for determining those risk factors, i.e., the GARCH model, appropriate for the purpose of estimating a long-term cost of equity?
- In what other contexts, e.g., academic, regulatory, or investment management, has the PRPM been used?
- What evidence is there of the model's predictive validity?
- Is the model applied consistently, both within this specific analysis and with its original intent?
- Do the results of this specific analysis appear reasonable?

Q. What underlying equity risk factors does the PRPM use to estimate returns?

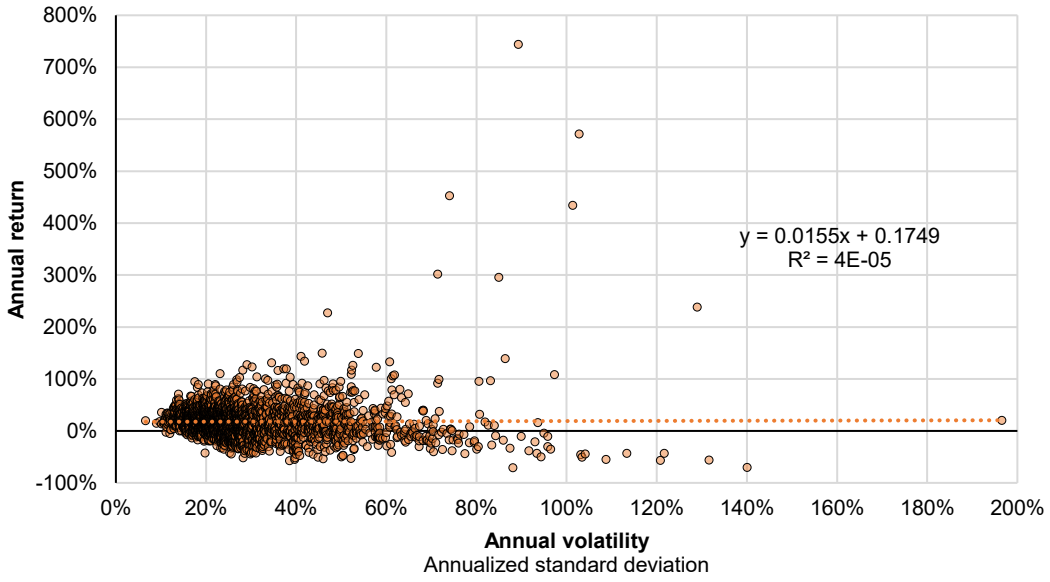
A. The PRPM uses one risk factor: the return volatility (standard deviation or variance) of each individual asset on its own, not relative to the market as a whole. As a result, the PRPM's cost of equity estimates reflect "*all* of the risk that investors actually face"[46] and "the risk to which investors are actually exposed, whether it's systematic risk or not."[47] While intuitively appealing, the PRPM's assumption that expected returns are correlated with total risk is not supported by either evidence or finance theory.

[46] Michelfelder, Ahern, D'Ascendis, Hanley, "Comparative Evaluation of the Predictive Risk Premium Model, the Discounted Cash Flow Model and the Capital Asset Pricing Model for Estimating the Cost of Common Equity," *The Electricity Journal*, 6:4 (May 2013), p. 85 [emphasis in original].

[47] Ahern, Hanley, Michelfelder, "New Approach for Estimating the Equity Risk Premium for Public Utilities," *The Journal of Regulatory Economics*, 40 (2011), p. 274.

Empirically, there is no observable relationship between total risk and return for individual securities, as can be seen in Figure 5, which plots annual total return against annualized volatility for the members of the S&P 500 for the five years 2016 through 2020.[48] The R^2 coefficient, a measure of how much of the return is explained by the standard deviation, is 0.00004, no better than random noise.[49]

Figure 5. Historical annual return vs. annual volatility for current S&P 500 members[50]
2016-2020



Q. Why don't returns reflect total risk?

A. Introductory finance textbooks sometimes begin their discussion of the fundamental principles of modern finance with this very observation: "there is no clear relationship between volatility and return," and "while volatility is perhaps a reasonable measure of risk

[48] Annualized volatility is the standard deviation of daily returns multiplied by the square root of 252, the approximate number of trading days in a year.
[49] For comparison, two sets of randomly generated numbers with the same mean and standard deviation as the sample can have an R^2 coefficient ten times higher.
[50] Index members as of October 31, 2021. M. Ellis analysis of S&P GMI absolute return data.

when evaluating a large portfolio, it is not adequate to explain the returns of individual securities."[51] The reason returns are not correlated to total risk is due to the benefits of diversification in reducing risk. The returns of individual stocks are not correlated, so their risks will tend to offset each other when held in a portfolio. Not all risk can be eliminated in this manner, but a significant portion can. The risk remaining after broad diversification is known as systematic or non-diversifiable risk; it can be thought of as the risk of the market overall, commonly represented by a broad market index like the S&P 500.

Diversification is easy and inexpensive – the management cost of index funds is on the order of 0.05%. If the diversifiable risk of stocks earned an additional risk premium, then investors could buy the stocks, capture the premium, and at the same time diversify and eliminate the risk. Under the no-arbitrage principle of financial markets, this opportunity to earn something for nothing would quickly be exploited and eliminated.[52]

A simple thought experiment demonstrates the fallacy of assuming expected returns should reflect total, not just systematic, risk. Consider an investor who buys a broadly diversified portfolio designed to replicate the market – say, every company in the S&P 500 in proportion to their weight in the index. Since, on average, their individual risks would be greater than the market as a whole (diversification reduces the risk of the market portfolio), by the logic of the PRPM, their expected returns should be, as well. Such an investor should expect their portfolio, which is meant to replicate the market, to beat the market. It's simply nonsensical.

[51] See, for example, Berk, DeMarzo, *Corporate Finance*, 3rd ed. (2014), p. 328.
[52] Ross, "The Arbitrage Theory of Capital Asset Pricing," *Journal of Economic Theory*, 13 (December 1976), pp. 341–360.

For these reasons – risk reduction through diversification and no arbitrage, two of the most fundamental principles of modern finance – a security's expected return tends to reflect only its systematic risk, not its total risk. There is no empirical or theoretical support for the PRPM's premise that returns should reflect *all* risk.

Q. Is the method for determining those risk factors, i.e., the GARCH model, appropriate for the purpose of estimating a long-term cost of equity?

A. The PRPM uses a statistical modeling technique known as generalized autoregressive conditional heteroskedasticity (GARCH). As described in "GARCH 101: An Introduction to the Use of ARCH/GARCH models in Applied Econometrics," an overview written by Robert Engle, the Nobel laureate who developed the technique, GARCH "models are especially useful when the goal is to analyze and forecast volatility"[53] – not returns, per se.

"Heteroskedasticity" refers to when the errors of an ordinary least squares regression (OLS) – of the type widely used elsewhere in finance and statistics, such as in the CAPM model[54] – are not constant over time. In practical terms, heteroskedasticity describes the phenomenon of stock and bond returns experiencing periodic bouts of high volatility that eventually return to a long-term average level. GARCH models explicitly model this time-varying, mean-reverting volatility. GARCH models are best suited to forecasting volatility in the near term – the next time step in the data series, e.g., one month into the future if using monthly returns. Given this near-term focus, the GARCH model is poorly suited for estimating long-term expected returns.

[53] Engle, "GARCH 101: An Introduction to the Use of ARCH/GARCH models in Applied Econometrics," NYU Working Paper No. FIN-01-030 (2001), p. 1.

[54] The security market line in the CAPM is an OLS of return vs. beta, and beta is an OLS of the returns of an individual stock vs. the market.

Importantly, "the regression coefficients for an ordinary least squares regression are still unbiased, but the standard errors and confidence intervals estimated by conventional procedures will be too narrow, giving a false sense of precision."[55] OLS models like the CAPM can still produce accurate estimates of the long-term average; it's just the uncertainty around those estimates that varies over time. The PRPM is an attempt to solve a problem that does not exist with the current models used to estimate the long-term cost of equity.

Q. In what other contexts, e.g., academic, regulatory, or investment management, has the PRPM been used?

A. The PRPM was originally developed by Mr. D'Ascendis's colleagues at his former employer, AUS Consultants, several of whom now work with Mr. D'Ascendis at Scott Madden. The PRPM has only ever been introduced in regulatory proceedings by a small cohort of consultants affiliated with AUS and/or Scott Madden.[56] All of the published academic articles about the PRPM have been authored by this small group, as well.[57] While the PRPM has been mentioned in a handful textbooks for utility cost of capital practitioners, it cannot be found in any general finance textbooks. There is no record of its use, in regulatory or academic contexts, by any parties other than its creators and their professional colleagues.[58]

[55] Engle, "GARCH 101," p. 1.
[56] During discovery, Mr. D'Ascendis was asked for a list of all known regulatory proceedings in which the PRPM has been introduced by experts other than his Scott Madden colleagues. He provided three examples, once by John Perkins in Maine PUC Case No. 2017-00198, and twice by Frank Hanley in Maryland PSC Case No. 9322 and Washington, DC, PSC Case No. 1093. Mr. Perkins was employed by Scott Madden at the time of his testimony; Mr. Hanley is a co-creator of the PRPM and former AUS employee.
[57] Data request response DOE 5-17b (Attachment MEE-4).
[58] Data request response DOE 5-17b (Attachment MEE-4).

Q. Is there any evidence of the model's predictive validity?

A. During discovery, Mr. D'Ascendis was asked for all available studies and analyses of the PRPM's ability to predict future returns. He provided copies of the two papers referenced in his testimony, neither of which provides substantive quantitative analysis of their predictive validity. They, do however, highlight substantial flaws in the model. Figure 6 presents two charts excerpted from the Ahern, et al, paper comparing actual annual returns to the predictions of the PRPM (blue), CAPM (red), and DCF (green) for a selection of utility companies. Even after adjusting for errors in the reported actual returns (purple; they have been inverted, so negative figures should be positive and vice versa), it is clear the PRPM has no validity in predicting actual returns even over the shorter time frame for which the model is specified.[59]

[59] The DCF and CAPM, as used in utility regulatory proceedings, are models of multi-year average expected returns, so it is not appropriate to evaluate their validity on a single-year basis.

Figure 6. Ahern, et al, comparison of PRPM estimated returns to CAPM, DCF, and actual returns[60]

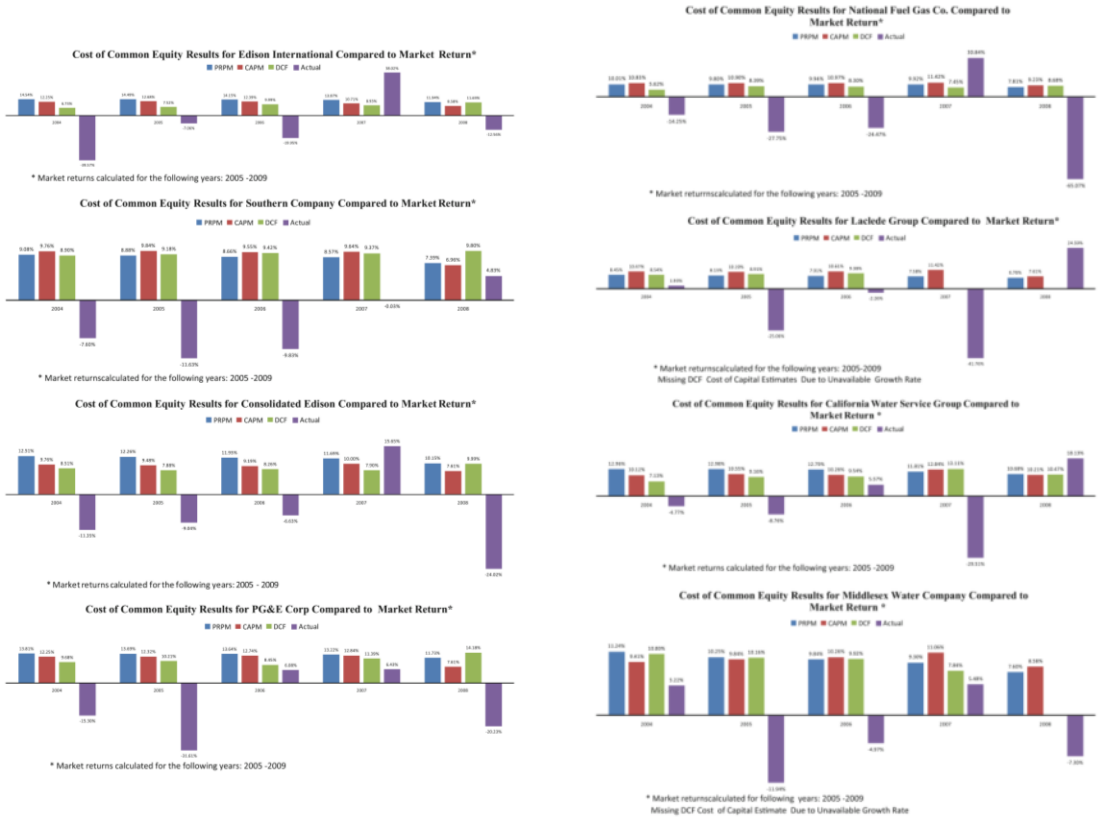
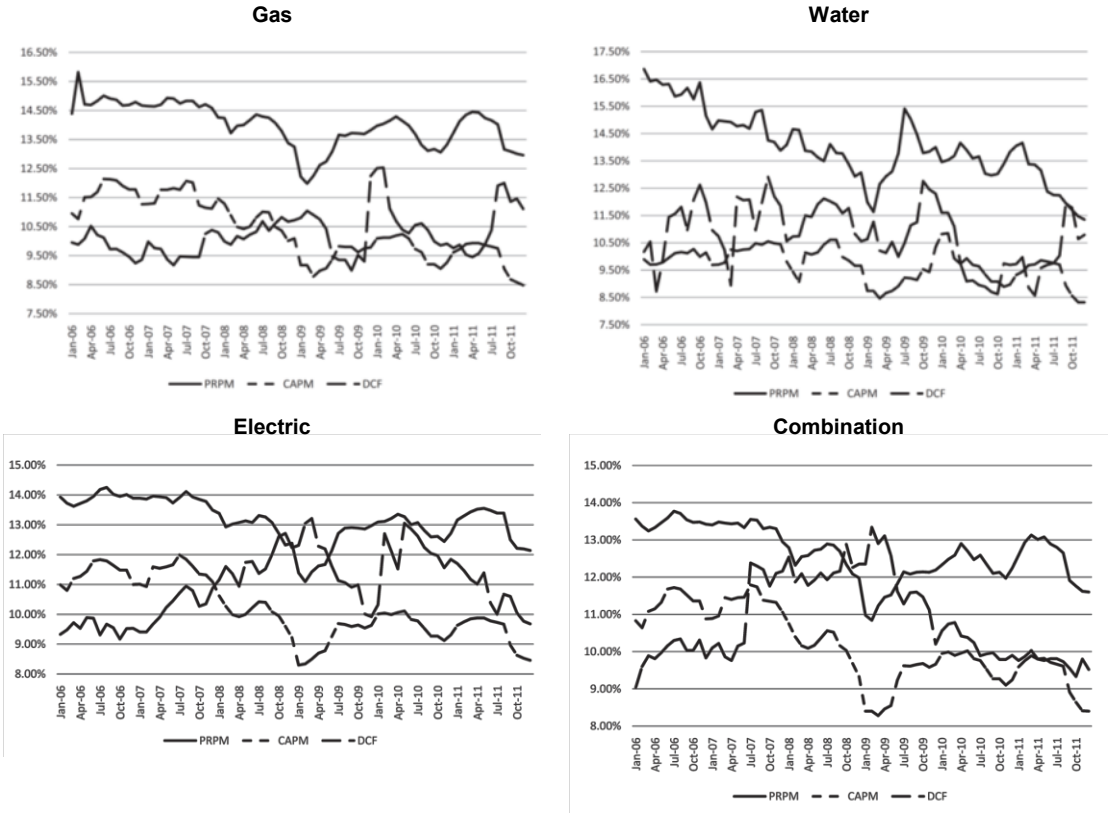


Figure 7 presents charts from the Michelfelder, et al, paper comparing the PRPM (solid), CAPM (dashed), and DCF (dot-dashed) results, one for each for four different categories of utilities. For gas and water utilities, the PRPM is consistently higher than the DCF and CAPM. For electric and combination utilities, it is also consistently higher except for approximately nine months of the six-year analysis window. This is to be expected, based on the model's premise of pricing all risk, not just systematic risk.

[60] Ahern, et al, "New Approach for Estimating the Equity Risk Premium for Public Utilities," *The Journal of Regulatory Economics*, pp. 275-76.

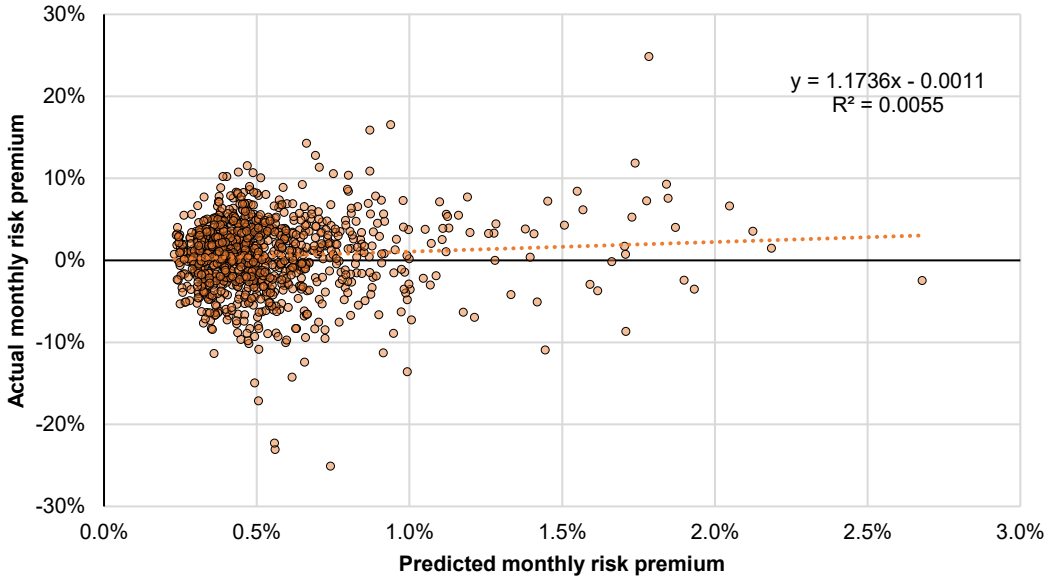
Figure 7. Michelfelder, et al, comparison of PRPM, CAPM, and DCF return estimates[61]



A more detailed analysis of the model's predictive validity was conducted on historical backcast data provided by Mr. D'Ascendis during discovery.[62] Figure 8 presents a cross-plot of the actual Ibbotson large company stock monthly risk premium against the PRPM's prediction from 1936 through 2019. Even at the monthly time step for which the PRPM is specified, it has virtually zero predictive validity, with less than 1% of the variation in the observed monthly risk premium explained by the PRPM ($R^2 = 0.0055$).

[61] Michelfelder, et al, "Comparative Evaluation of the Predictive Risk Premium Model, the Discounted Cash Flow Model and the Capital Asset Pricing Model for Estimating the Cost of Common Equity," pp. 87-88.
[62] Data request response DOE 4-2 Attachment 1 (Attachment MEE-5).

Figure 8. Large-cap composite monthly risk premium, actual vs. PRPM prediction[63]
1936-2019



The backcast data is for a broad market portfolio, for which a clear relationship between volatility and return might be expected (see above). Mr. D'Ascendis would not provide similar backcast data for the UPG members,[64] but there is no reason to expect that the PRPM's predictive validity would be any better for individual stocks. Simple inspection of the models results reveals this to be true. The predicted risk premia for the Utility Peer Group range from 7.05% to 14.28%, unreasonably wide for companies with similar risk profiles.[65] As with Mr. D'Ascendis's DCF model results, such dispersion is another indication that the PRPM model is improperly specified for its intended use.

Q. Does Mr. D'Ascendis apply the model consistently, both across its various uses in his analysis and with its original intent?

[63] M. Ellis analysis of data request response DOE 4-2 Attachment 1. Annualized PRPM results were converted to monthly values for apples-to-apples comparison with actual monthly risk premium data (Attachment MEE-5).
[64] Data request response DOE 5-17c (Attachment MEE-4).
[65] Attachment DWD-4, p. 2.

A. No. As summarized in Table 7, within the RPM, Mr. D'Ascendis uses the PRPM to calculate several different risk premia. The first inconsistency is his use of three different interest rate indexes: Treasurys, Aaa/Aa2-rated corporate bonds, and A2-rated public utility bonds. No explanation is provided for these choices.

The risk premium is calculated as the product of two outputs of the GARCH model: the predicted conditional variance and the GARCH coefficient, which can be considered the slope of the regression line between the risk premium and the predicted variance. For the UPG members, the variance used is the average of the current (spot) conditional variance and the average of all historical conditional variances. In contrast, for the three index risk premia, the variance used is the average of all historical conditional variances. Mr. D'Ascendis does not provide any explanation for this difference in approach beyond exercising "his professional judgment."[66]

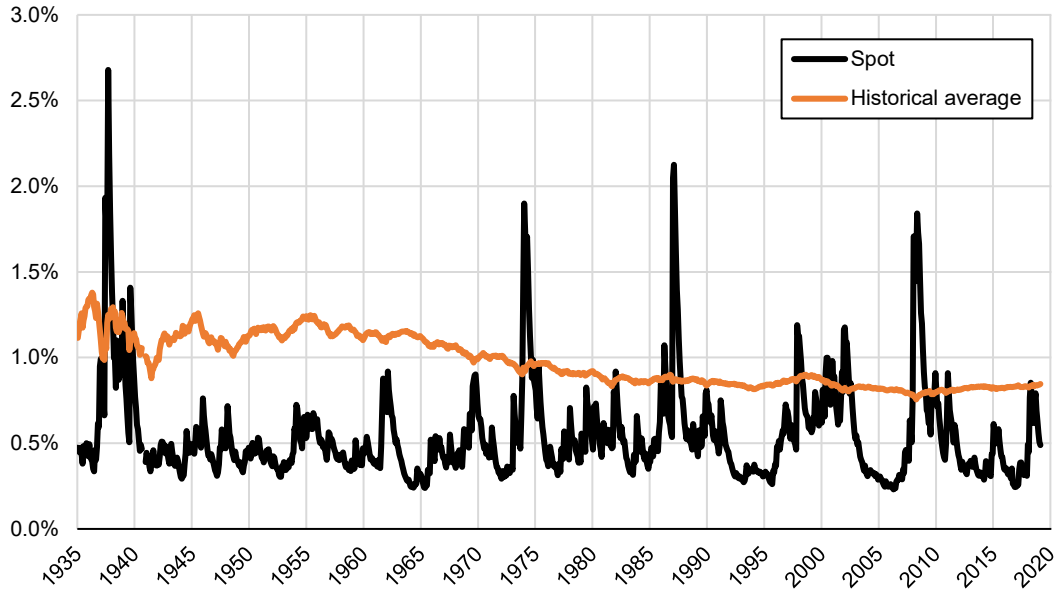
The use of the historical average variance is inconsistent with the intent of the GARCH model, which is best suited for predicting volatility in the next time step – one month, in this case, as Mr. D'Ascendis is using monthly returns. Presumably, using just the spot variance would introduce significant variability in the predicted risk premium, casting doubt on the model's reliability. The annualized risk premium in the backcast data range up to 37% – too high to reasonably reflect investors' long-term return expectations.

Using the historical average variance, though, introduces significant upward bias. Figure 9 shows the same backcast risk premium data in Figure 8, as well as the risk premium recalculated using the same trailing average historical conditional variance back to January 1926 used by Mr. D'Ascendis.[67] The arithmetic average monthly risk premium nearly

[66] Data request response DOE 5-17d (Attachment MEE-4).
[67] Data request response OCA 1-1 Attachment, tab PRPM WP1 (Attachment MEE-6).

doubles, from 0.54% to 0.97%; the corresponding arithmetic average annualized risk premium increases from 6.77% to 12.36%. This surprising result appears related to the time period over which the trailing historical variances are averaged. It is clear, though, that the long-term average yields a significantly upwardly biased risk premium relative to the monthly spot estimate for which the GARCH model is intended. A similar bias appears in the other two index-based PRPM risk premia.

Figure 9. Large-cap composite PRPM predicted monthly risk premium using spot and average historical variance[68]



An additional source of upward bias arises from Mr. D'Ascendis's annualization of monthly rates using the formula: $annual = (1 + monthly)^{12} - 1$, which assumes there is no month-to-month variability in the risk premium. As discussed above, any variability will reduce the realized return over multiple time periods. The GARCH model is a model of conditional variance, and its results change each month. Converting the monthly expected

[68] M. Ellis analysis of data request response DOE 4-2 Attachment 1 (Attachment MEE-5).

risk premium to an annual rate would require downward adjustment for this volatility; Mr. D'Ascendis fails to do so. This source of bias is largely mitigated by his decision to use the historical average variance, which is much less volatile than the spot variance, but it introduces even more upward bias in the resulting equity risk premium.

Q. Do the results of the analysis appear reasonable?

A. As noted above, the UPG results, which are based on an average of historical and spot variance, are too dispersed to be reasonable. The key driver of this dispersion is their GARCH coefficients, which range from 1.5198 to 5.9529.[69] The GARCH coefficient is the relationship between volatility and return in excess of the risk-free rate. The UPG members all have similar risk profiles, so it is not clear why this relationship should vary so much among them. It appears to be a statistical artifact of Mr. D'Ascendis's implementation and application of the model. The highest GARCH coefficient is for American Water Works (ticker AWK), which also has the least historical return data for use in the model, although over twelve years of data are used. Mr. D'Ascendis ultimately removes AWK from the UPG PRPM analysis as "not meaningful."[70] That the PRPM requires decades of company-specific historical data to produce meaningful results raises other concerns, such as the validity of forward-looking expected return estimates based on a model so sensitive to data from over a decade in the past, and is yet one more indication of the PRPM's unsuitability for estimating the type of long-term return required in utility regulatory proceedings.

[69] Attachment DWD-4, p. 2.
[70] Attachment DWD-4, p. 2.

Q. Do you have any other concerns with the PRPM?

A. Mr. D'Ascendis adds the risk premia calculated for each UPG member to the 30-year Treasury (T30). Given that we are estimating the long-term cost of equity, this is an appropriate choice. But in estimating the risk premium using the GARCH model, he uses Ibbotson's long-term government bond data, which is based on the 20-year Treasury.[71] Because the T30 tends to have a higher yield than the 20-year – +0.07% on average over the year through December 2021 – his estimated risk premium will be overstated relative to the 30-year benchmark. This upward bias arises as well in his implementation of the CAPM model, where various estimates of the market risk premium are estimated from historical data.

Additionally, Mr. D'Ascendis uses a forecast, not current market, T30 rate. There are several problems with forecast rates; the most critical is that his source, Blue Chip Financial Forecasts (BCFF), has been consistently upwardly biased for over two decades. He also uses forecast rates in his CAPM analysis, so I will cover this issue in more detail there.

Q. What is your overall assessment of the PRPM model and its results?

A. The premise of the PRPM violates the most fundamental principles of finance theory, is unsuitable for estimating long-term returns, lacks empirical invalidity, has not been used by anybody other than its developers and their coworkers, contains numerous flaws in its conception and implementation, is applied inconsistently, and produces clearly biased and unreasonable results. It is entirely unsuited for estimating the cost of equity in a utility cost of capital proceeding, and any and all results using the PRPM should be disregarded.

[71] Ibbotson, Harrington, *Stocks, Bonds, Bills, and Inflation 2021 Summary Edition* (2021), pp. 44.

2. Total market approach

Q. What is the total market approach to the risk premium model?

A. "Total market approach" (TMA) is the term Mr. D'Ascendis uses to refer to the more common version of the risk premium model, as distinct from the PRPM, in which the cost of equity is estimated by adding a utility-specific equity risk premium to a utility bond yield.

Mr. D'Ascendis's TMA entails a number of constituent analysis, as outlined in Table 7. Two utility equity risk premia are estimated. The first is the beta-adjusted premium of the large-cap index over the average Aaa/Aa2- or Aaa-rated corporate bond yield (beta-adjusted MRP). The second is the premium of the S&P Utilities Index over the A2-rated utility bond yield (URP). The average of these two premia is added to a bond yield meant to reflect the UPG's, and presumably Aquarion's, cost of debt. It is based on the Aaa-rated corporate bond yield, with adjustments to reflect the UPG's/Aquarion's lower credit quality.

Q. Are Mr. D'Ascendis's two implementations of the risk premium model sound?

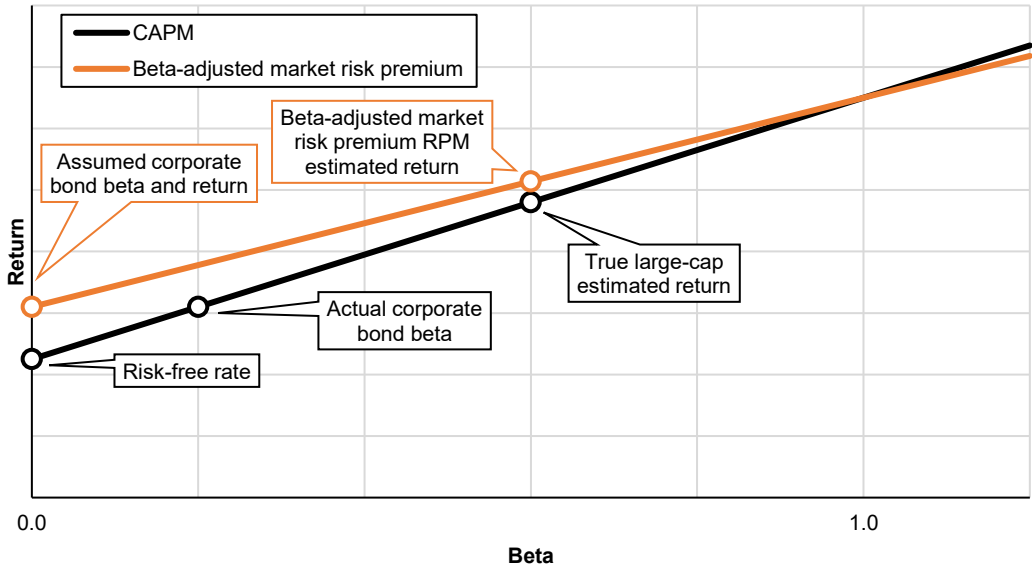
A. Both models are conceptually flawed. In addition, there are errors in his estimates of the bond yield and the two risk premia.

Q. What is the conceptual flaw in the beta-adjusted MRP?

A. The beta-adjusted MRP is essentially a modification of the CAPM – which estimates returns as a linear function of the market risk premium and beta, or an asset's non-diversifiable risk – substituting the corporate bond rate for the risk-free rate. A key assumption of the CAPM is

that the rate against which the market risk premium is measured has a beta of zero and is risk-free, i.e., has no chance of default, neither of which is true of corporate bonds.[72] As illustrated in Figure 10, assuming corporate bonds have a beta of zero and no default risk effectively raises the floor to which the risk premium is added and reduces the slope of the security market line (the relationship between beta and return). These erroneous assumptions systematically inflate the resulting COE estimate as long as the equity beta is less than 1.0, which is generally true of utilities.

Figure 10. CAPM and (erroneous) beta-adjusted market risk premium security market lines



Q. What is the conceptual flaw in the URP?

A. The conceptual flaw in the URP is its failure to adjust for differences in expected return between the UPG/Aquarion and the utility index arising from differences in their credit

[72] From June 1926 through December 2021, the beta of Aaa- and Baa- rated corporate bonds has averaged 0.05 and 0.15, respectively, while the beta of the 20-year Treasury has averaged 0.01 (and not statistically significantly different from 0). M. Ellis analysis of FRED and FDL data.

quality and/or leverage. While Mr. D'Ascendis adjusts the bond yield to reflect this difference (erroneously, as will be explained below), he neglects to correspondingly adjust the risk premium, in the same manner that he neglects to adjust his DCF and CAPM results for differences in leverage between his proxy groups and Aquarion's target capital structure.

The market capitalization-weighted average credit rating of the utility stock index members is currently 36/64 A3/Baa1.[73] It undoubtedly has varied over time. Consequently, it is not possible to know the credit quality, and risk profile, embedded in the three of the four URP models that use historical data (all but DCF). Not knowing the credit quality and risk profile embedded in these three estimates of the utility risk premium renders them incomparable to the UPG/Aquarion.

In principle, the DCF-based URP could be adjusted for the difference in credit quality between the UPG/Aquarion and the utility index, but Mr. D'Ascendis fails to do. Because the utility index's average credit rating is more than a full grade below the UPG/Aquarion's, its equity is correspondingly riskier and higher-cost. Mr. D'Ascendis's DCF URP therefore overstates Aquarion's COE.

Q. How is the bond yield estimated?

A. Mr. D'Ascendis starts with the Aaa-rated corporate bond rate, for which he uses forecast, not current market, rates. There are several problems with forecast rates; the most critical is that his source, Blue Chip Financial Forecasts (BCFF) has been consistently upwardly biased for over two decades. He also uses forecast rates in his CAPM analysis, so I will cover this issue in more detail there.

[73] M. Ellis analysis of S&P Global Market Intelligence data, as of December 3, 2021.

Mr. D'Ascendis makes two adjustments to the Aaa-rated corporate bond yield: one for the difference between the yields on A2-rated public utility bonds – the benchmark against which the utility risk premium is calculated – and Aaa-rated bonds (0.54%); and a second for the difference between the Utility Proxy Group's assumed average rating (between A2 and A3) and A2-rated public utility bonds (0.06%), for a total of 0.60%.

Q. Are these adjustments correct?

A. The first adjustment is correct mathematically, although, as explained below, it is inconsistent with Mr. D'Ascendis's risk premium calculations.

The second adjustment is incorrect because Mr. D'Ascendis miscalculates the UPG average credit rating. Separate average numerical equivalent ratings for Moody's (6.5) and S&P (5.9) are apparently "eyeballed" to arrive at an average numerical rating of 6.5.[74] Moody's ratings are available for only two of the companies, though, so his calculation effectively gives each a 25% weight in the average, instead of a more appropriate 1/14 (7 companies x 2 ratings per company). Calculating each company's average rating across S&P and Moody's and then averaging across companies yields a numerical rating of 6.07, solidly in the A2 category.

Q. Do you have any other concerns with these adjustments?

A. Yes. The bond yield to which the risk premium is added in the RPM must be equivalent to that used to calculate the risk premium. But Mr. D'Ascendis's A2/A3-equivalent adjusted bond yield does not match the bond yield used to calculate his risk premia. In fact, Mr.

[74] Attachment DWD-4, p. 3. The adjustment is one-sixth of the difference between A2 (numerical rating of 6) and Baa2 (9) bonds.

D'Ascendis calculates the risk premium using *three different* bond yields – Aaa/A2 average and Aaa corporate bonds, and A2 public utility bonds – none equivalent to the adjusted bond yield.

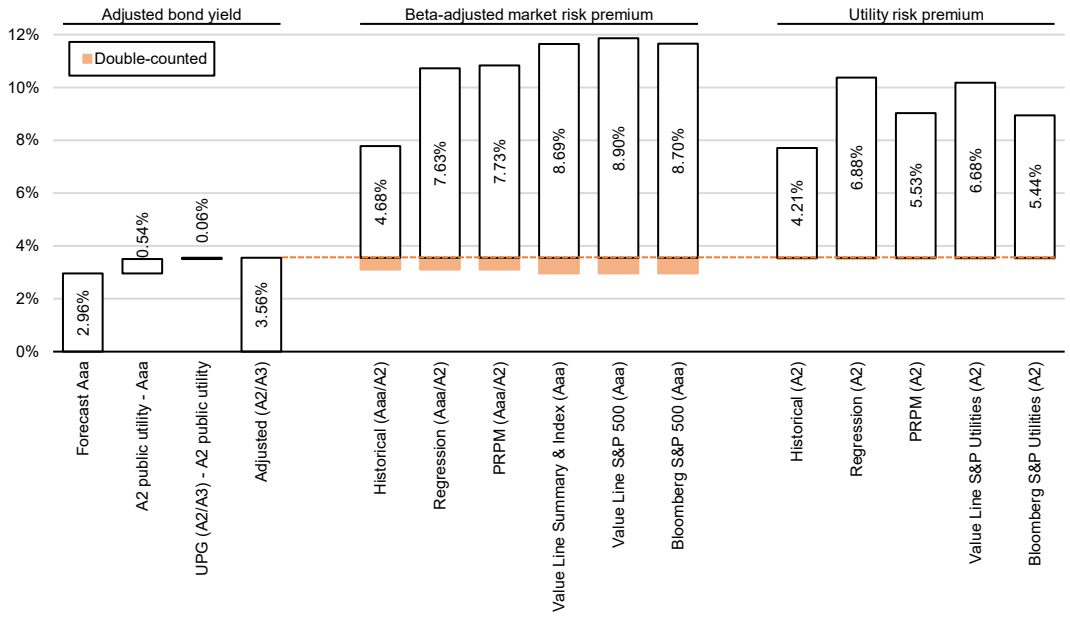
Q. What is the implication of using different rates in his adjusted bond yield, MRP, and URP calculations?

As shown in Figure 11, Mr. D'Ascendis averages six different estimates for his beta-adjusted MRP. Three are calculated relative to the Aaa/A2 average, the other three relative to Aaa. The URP averages five estimates calculated relative to a third rate, the A2-rated public utility yield. No explanation is given for using these different bond rates, but, clearly, their results are not comparable.[75] All of Mr. D'Ascendis's risk premia are calculated relative to a higher-quality, lower-yield bond than the A2/A3 adjusted bond yield, so the differences in yield between the A3/A2 average and these benchmarks, indicated by the light orange bars in Figure 11, are double-counted.

There is an additional error in the regression-based MRP. The regression is based on the historical Aaa/A2 average bond yield, but the MRP is calculated using the forecast Aaa rate.[76] This increases the estimated beta-adjusted MRP from 7.49% to 7.63%.[77]

[75] Mr. D'Ascendis could have calculated all MRP and URP estimates relative to Aaa-rated corporate or A2-rated public utility bonds, for which ample historical data are available, although doing so would still not address both models' conceptual flaws.
[76] Data request response OCA 1-1 Attachment 1, tab MRP ERP WP (Attachment MEE-7).
[77] The forecast Aaa/Aa2 bond yield, 3.10%, is estimated by interpolating between the forecast Aaa and Baa yields provided in data request response OCA 1-1 Attachment 1, tab MRP WP1 (Attachment MEE-8).

Figure 11. TMA bond yield and risk premia calculations[78]



Q. Do you have any concerns with Mr. D'Ascendis's various risk premium models, beyond their inconsistent bond yields?

A. Yes. Mr. D'Ascendis uses four different models to estimate each risk premium: historical average, regression, PRPM, and DCF. For the MRP, the DCF is run using three different sets of input assumptions, for a total of six estimates. I have already discussed my concerns with the PRPM and DCF models. Mr. D'Ascendis also uses all four models in his CAPM analysis. Here, I will give an overview of my concerns with the historical average and regression models. I will provide more detail in my discussion of his implementation of the CAPM.

- *Historical average*: The main shortcomings with Mr. D'Ascendis's historical average risk premium estimates are the use of the arithmetic average for both the equity and bond returns, and the use of income-only returns for the bonds. Geometric returns better reflect long-term investor expectations, and total returns better reflect what investors actually

[78] Attachment DWD 4, pp. 9, 12.

realize on bond investments. Few investors hold long-term bonds to maturity, the only way to realize the income-only return.

- *Regression*: The regression risk premium model also uses income-only, not total, returns, and produces the equivalent of an arithmetic return. It suffers from two further flaws. The modeled causal relationship in which the 12-month trailing return is determined by the bond rate in the 12th month only – e.g., the return from January through December is determined by the bond rate in December only – is simply not plausible. As would be expected from such an invalid causal relationship, the statistical significance of the resulting regression model is no better than random, so its results are not meaningful.
- *PRPM*: As explained above, the PRPM suffers numerous deficiencies. Any risk premium based on this model should be disregarded.
- *DCF*: Mr. D'Ascendis uses the same constant-growth DCF model used to estimate the COE for each of the UPG members. Here, he calculates market capitalization-weighted average COEs for the members of the S&P 500 and Utilities Indexes using Bloomberg and Value Line data, and an additional COE using growth estimates for Value Line's Summary & Index. As explained above, the CG DCF's main shortcoming is the assumption that analysts' three-to-five-year growth estimates can be sustained into perpetuity. His results are therefore significantly upwardly biased.

Q. What is your overall assessment of the total market approach?

A. Both the beta-adjusted MRP and URP models suffer numerous flaws in their overall concept, inconsistent use and consequent double-counting of bond yields, and constituent risk premium models. The results of the TMA should be disregarded.

3. Risk premium model conclusion

Q. And of Mr. D'Ascendis's risk premium model overall?

A. Mr. D'Ascendis's risk premium model is the combination of two models deeply flawed in both concept and implementation, the PRPM and total market approach. His RPM results should be disregarded from consideration.

G. CAPITAL ASSET PRICING MODEL

Q. What is the capital asset pricing model (CAPM)?

A. Mr. D'Ascendis analysis incorporates another well-known COE model, the capital asset pricing model (CAPM). It estimates the cost of equity, k, from the formula:

$$k = r_f + \beta(r_m - r_f)$$

where r_f is the risk-free rate (typically a long-term US Treasury), r_m is the expected return on the market, and β is a measure of risk of the company in question relative to the market. Typically, the market risk premium (MRP), the difference between the market return and the risk-free rate, $r_m - r_f$, is estimated instead of the market return, per se, and then added to r_f.

Mr. D'Ascendis also uses a modified version of the CAPM called the Empirical CAPM (ECAPM). His final CAPM COE is the simple average of the traditional CAPM and ECAPM results.

1. Risk-free rate

Q. How does Mr. D'Ascendis estimate the risk-free rate?

A. Mr. D'Ascendis uses the 30-year Treasury (T30) for his risk-free rate. Given that we are estimating the long-term cost of equity, this is an appropriate choice. Nonetheless, several of

his market risk premium estimates use Ibbotson's long-term government bond data, which is based on the 20-year Treasury.[79] Because the T30 tends to have a higher yield than the 20-year – +0.07% on average over the year through December 2021 – his estimated market risk premium will be overstated relative to his chosen interest rate. This upward bias arises as well in his implementation of the PRPM for the individual UPG members, which is also based on the T30.

More critically, as with his risk premium model – PRPM and total market approach – Mr. D'Ascendis uses a forecast, not current market, rate. Specifically, he uses the Blue Chip Financial Forecast (BCFF) consensus, which is based on a survey of approximately forecasters from such firms as Moody's, J. P. Morgan, and Wells Fargo.

Q. What's wrong with using a forecast rate?

There are several concerns with using interest rate forecasts instead of current market rates. First, doing so is inconsistent with the time horizon of the DCF, which is estimated as of today (or, more precisely, as of the end of the trailing price averaging period). The mathematical formula for the present value of a periodic time series upon which the DCF is based discounts the stream of future cash flows to a "time zero" one period before the first payment. The resulting discount rate is as of that time zero. The first payment in the DCF model is typically assumed to occur time step from today; therefore the rate determined by the DCF model is as of today. Using an interest rate expected on some future date in the risk premium model produces an expected return as of that future date, not today, that is not directly comparable to the DCF.

[79] Ibbotson, Harrington, *Stocks, Bonds, Bills, and Inflation 2021 Summary Edition* (2021), p. 44.

Second, Mr. D'Ascendis provides no explanation for his choices and weightings of the available forecasts. He uses a simple average of six quarterly and two five-year forecasts, all as of some time up to eleven years in the future. How is this weighting linked to our task of estimating the cost of equity for ratemaking purposes? Should the estimated COE reflect expectations as of today, as of the future effective date of the rate case, on average over the interval to the next rate case? If either of the latter two, what dates are assumed? How does Mr. D'Ascendis's specific combination of forecast rates reflect investor expectations for the relevant time horizon? Mr. D'Ascendis does not address any of these questions or provide any rationale for his selection or weighting of the various forecasts available.

Third, there is no reason to believe BCFF in any way represents an aggregate "market" view. BCFF has no more than a hundred thousand subscribers,[80] less than 0.1% of the hundreds of millions of investors who are exposed to Treasury rates through direct investments or as a benchmark for other investments.[81]

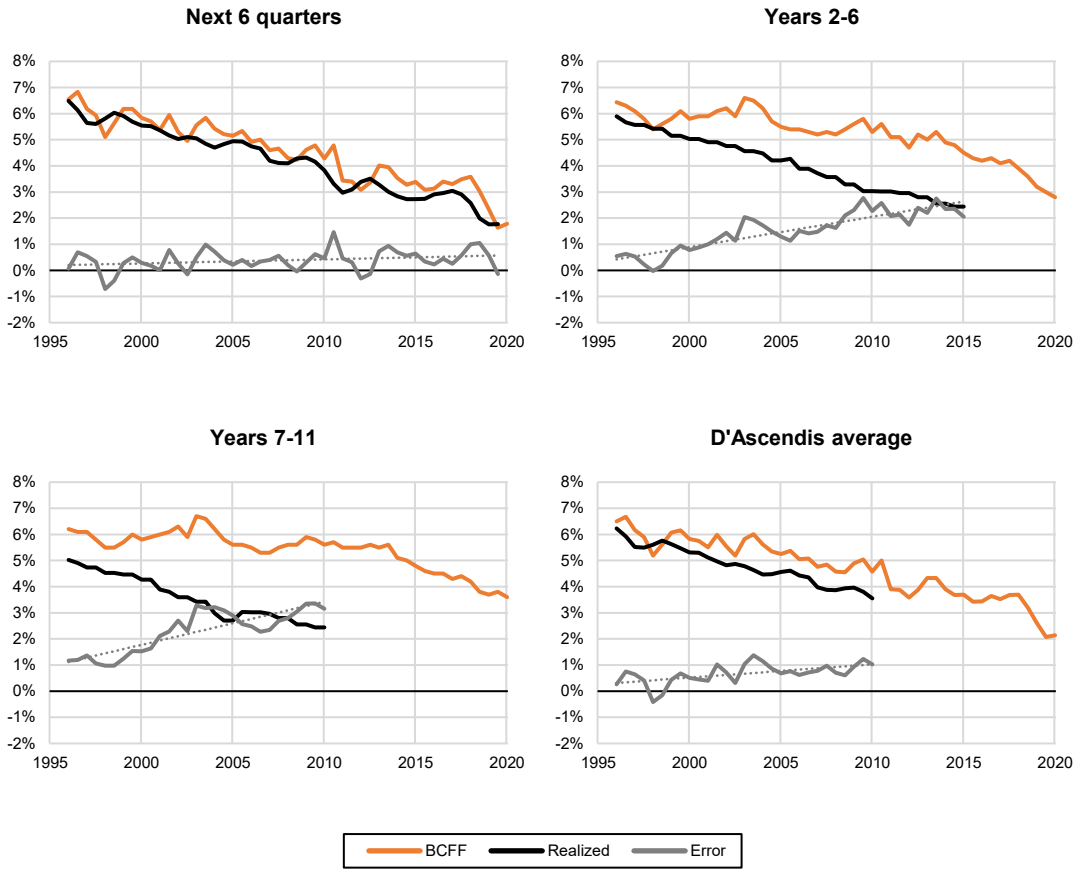
Fourth, and most importantly, BCFF has a multi-decade track record of producing systematically upwardly biased forecasts, and the errors have only increased over time. Figure 12 compares four BCFF forecasts – average of next six quarters, years two to six, years seven to eleven, and Mr. D'Ascendis's unweighted average – to their corresponding future average realized rates, going back to BCFF's first long-range forecast in December 1996. All three have consistently overestimated future rates, and the forecast errors have

[80] In the 2020 annual report of Wolter Kluwers, BCFF's owner, $905 million of revenue was attributed to the Legal & Regulatory segment, of which BCFF is just 1 of 99 offerings (https://www.wolterskluwer.com/en/legal/our-solutions). BCFF costs approximately $2,500/year. Even assuming BCFF accounts for 10% of segment revenue – roughly ten times the segment average – BCFF has no more than 40,000 subscribers.

[81] More than half of US adults and households are invested in the stock market. See, for example, https://www.pewresearch.org/fact-tank/2020/03/25/more-than-half-of-u-s-households-have-some-investment-in-the-stock-market/ and https://news.gallup.com/poll/266807/percentage-americans-owns-stock.aspx.

tended to increase over time. The same analyses of BCFF's Aaa-rated corporate bond forecasts, used in Mr. D'Ascendis's risk premium model, produce similar results.

Figure 12. BCFF 30-year Treasury forecast vs. average realized rate[82]



Q. Is Mr. D'Ascendis aware of BCFF's poor accuracy?

A. Yes. At least one other cost of capital expert has provided similar evidence to mine pointing out the systematic errors in BCFF forecasts.[83]

[82] M. Ellis analysis of BCFF and FRED data. From June 2002 through June 2005, BCFF forecast the long-term average or 20-year Treasury instead of the 30-year. Those forecasts are used in this analysis.

[83] Direct Testimony of Aaron L. Rothschild on behalf of the South Carolina Department of Consumer Affairs, PSC of South Carolina Docket No. 2019-290-WS (January 23, 2020), pp. 18-19.

Q. What is Mr. D'Ascendis's rationale for continuing to use BCFF forecasts despite their poor accuracy?

A. In support of his use of BCFF's forecast discount rates despite their inaccuracy, Mr. D'Ascendis argued in a recent proceeding:[84]

> It is not the accuracy of the forecasts that is relevant, but whether or not investor expectations reflect those forecasts. Investor reaction to analysts' forecasts, whether they be growth rate or interest rate forecasts, can be likened to weather forecasts. For example, typically one prepares for forecasted severe weather, i.e., snowstorms and / or hurricanes, regardless of the historical accuracy of, or any inherent bias in, the weather forecasting. When severe weather is forecasted, those expected to be affected generally begin preparing by storing supplies of food, batteries, candles, etc. If the severe weather does not materialize, apparently that does not stop them from making the same preparations the next time severe weather is predicted.

Later in that testimony, he invokes the efficient markets hypothesis (EMH) – all available information informs investor expectations – as further support for the use of forecast rates. Mr. D'Ascendis further argues that if BCFF's "information were ignored by investors, the publication would have been discontinued."

Q. Are these arguments valid?

A. No, they are not. To begin with, as already mentioned, BCFF subscribers account for a tiny fraction of the market; there is no reason to believe they reflect the market in aggregate. In his weather analogy, how much influence would the forecast have if less than one in a thousand people were even aware of it?

Mr. D'Ascendis uses the BCFF forecasts as-is, with no adjustment for their historical inaccuracy. In doing so, he implicitly insists that investors rely *only* on BCFF forecasts, to the exclusion of all other ways investors might develop their expectations. Yet his two

[84] Rebuttal Testimony of Dylan W. D'Ascendis for Blue Granite Water Company, PSC of South Carolina Docket No. 2019-290-WS (February 6, 2020), pp. 48-51.

arguments in support of this contention – accuracy doesn't matter and EMH – contradict each other. The consistent errors in BCFF forecasts are also public information; the Congressional Budget Office has published reports assessing the accuracy of BCFF and its own interest rate forecasts for nearly twenty years.[85] According to EMH, investors take that information into account, as well. The weather forecast analogy is apt; if the local weathercast is consistently too high – for over twenty years – people eventually learn to dress for cooler weather than forecast.

Mr. D'Ascendis's argument that if BCFF "were ignored by investors, the publication would have been discontinued" also is not compelling. Investment decisions are the result of assimilating multiple types and sources of information and processing them in complex, woften idiosyncratic ways. The small share of investors who purchase BCFF reports might do so fully aware that its bond yield forecasts are biased and adjust them accordingly and/or use them in conjunction with other information.

This argument also ignores the bond yield forecasts' context. BCFF and similar services typically include dozens or hundreds of different forecasts, as well as commentary and analysis. Investors might continue to purchase these services for those offerings, not their bond yield forecasts. Other customers might have a vested interest in optimistic forecasts and be willing to pay for an ostensibly objective third-party source.

Mr. D'Ascendis's contention that BCFF forecasts reflect market expectations is especially egregious with respect to interest rates. There is an inverse relationship between the value of a bond and its interest rate. If investors expected rates to increase, as BCFF has consistently forecast for the last two decades, they would not buy at current prices, as they

[85] Congressional Budget Office, "CBO's Economic Forecasting Record" (November 2002), pp.

would be investing with the expectation of losing money. That investors do buy bonds at current rates is prima facie evidence that their expectations differ from BCFF's.

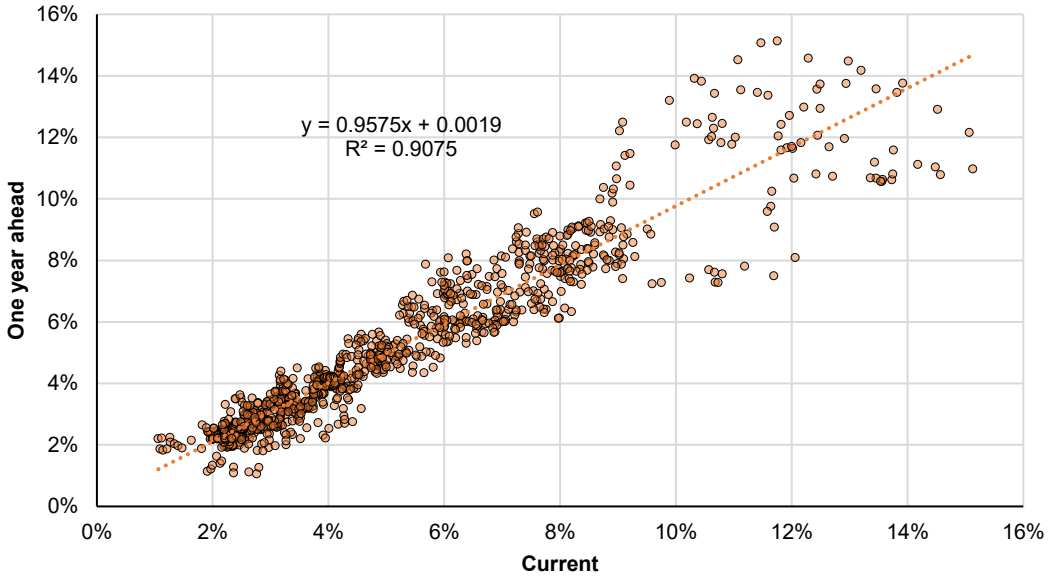
Q. Suppose we ignored the concern about consistency with the DCF and wanted a forecast interest rate. What should we use?

A. It turns out that current rates generally provide an unbiased forecast of future rates. Figure 13 is a cross-plot of the 20-year Treasury rate one year ahead against the current rate. Approximately 91% of the variation in future rates is explained by the current rate; for rates two years in the future, 84% is explained, and for rates in three years, 79%. Regardless of the forecast horizon, the current rate is unbiased – exhibiting no tendency to be systematically too high or too low.[86] Similar predictive validity is obtained for 30-year Treasurys and corporate bonds.[87]

[86] The bias in a forecast can be assessed from the decomposition of the mean square error into bias, inefficiency, and random variation components. See, for example, Mincer and Zarnowitz, "The Evaluation of Economic Forecasts," Economic Forecasts and Expectations: Analysis of Forecasting Behavior and Performance, (NBER, 1969), pp. 3-46; available at: http://www.nber.org/chapters/c1214. For the 20-year Treasury, bias accounts for less than 0.16% of forecast error at all three forecast horizons.

[87] The 20-year Treasury is used here because much more historical data are available.

Figure 13. Twenty-year Treasury rate, one year in the future vs. current[88]
January 1925-December 2021



This finding is consistent with an extensive body of academic research rejecting the "expectations hypothesis," which posits that information about future interest rates can be gleaned from forward rates implied by the yield curve (the plot of interest rate versus bond maturity). Academics have generally concluded that the yield curve does not contain any information about expected changes in interest rates; the difference between long- and short-term rates is due exclusively to the "term premium," or compensation for the uncertainty in future interest rates.[89] In combination with BCFF's poor track record, this finding is also consistent with an extensive body of research on the superiority of simple prediction models to both more complex models and expert judgment.[90]

The predictive validity of current rates has been acknowledged among utility cost of capital experts. Reviewing the academic research, Roger Morin, author of the frequently

[88] M. Ellis analysis of FRED data.
[89] See, for example, Welch, "A Different Way to Estimate the Equity Premium," manuscript (2007); available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1077876.
[90] See, for example, Kahneman, Sibony, Sunstein, *Noise: A Flaw in Human Judgment* (2021), pp. 111-147.

cited practitioner text, *New Regulatory Finance*, concludes, "The literature suggests that on balance, the bond market is very efficient in that it is difficult to consistently forecast interest rates with greater accuracy than a no-change model."[91]

In summary, if we need to use a forecast rate, the current rate is as good an estimate as we're likely to find. Conveniently, this also entirely skirts the potential concern about horizon inconsistency with the DCF.

2. Beta

Q. How does Mr. D'Ascendis estimate beta?

A. Mr. D'Ascendis uses the average of Value Line's and Bloomberg's adjusted beta values.

Q. How do Value Line and Bloomberg estimate their betas?

A. Their methodologies differ in a number of details, which is why their beta estimates are not identical. Both estimate "raw" betas from a regression of trailing stock returns against the trailing returns of the market, use weekly price-only returns, and adjust their raw betas to correct for their tendency, on average, to regress toward the market mean over time. But the similarities end there. Table 8 summarizes the key differences in Value Line's and Bloomberg's beta estimation methodologies.

[91] Morin, *New Regulatory Finance* (2006), p. 172.

Table 8. Value Line and Bloomberg beta estimation methodologies[92]

Parameter	Value Line	Bloomberg
Return frequency	Weekly (Friday)	Weekly (Friday)
Trailing history	5 years	2 years
Index	NYSE Composite	S&P 500
Return calculation		
Price-only/total	Price-only	Price-only
Excess/absolute	Absolute	Absolute
Simple/logarithmic	Logarithmic	Simple
Blume adjustment parameters	0.65 x raw + 0.37	2/3 x raw + 1/3
Rounding	Nearest 0.05	None
Updating frequency	Approximately quarterly	Daily

I point out these differences between Value Line's and Bloomberg's beta estimation methodologies to highlight that there is no standard, widely accepted method for estimating beta. Table 9 summarizes some of the different methodologies used by academics and data providers.

Table 9. Sample of beta calculation methodology options

Timing	Return calculation	Adjustment
• Return frequency: daily, weekly, monthly • Trailing history: typically one to five years	• Simple or log • Price-only or price-plus-dividend (total) • Absolute or excess relative to the risk-free rate • Market proxy: S&P 500, NYSE Composite, CRSP US universe	• None • Blume • Vasicek • Scholes-Williams • Time decay • Winsorization

Q. What are the main sources of discrepancy among providers of beta estimates?

A. The largest potential differences among data providers' beta estimates arise from their trailing history, return frequency, and adjustment assumptions. Following bouts of high market volatility, such as was experienced in February and March 2020, betas will be affected as long as the trailing history includes the volatile period, even if market conditions

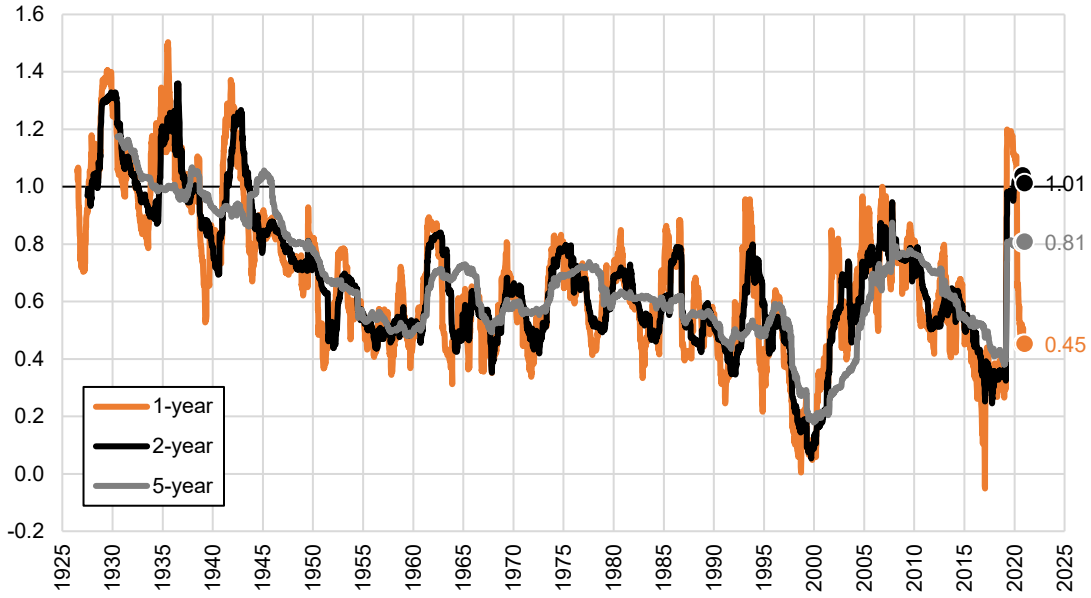
[92] Data request response Staff 2-46 Attachments 2 and 3. Simple price-only returns: $r = \frac{P_{t+1}}{P_t} - 1$; logarithmic price-only returns: $r = \ln \frac{P_{t+1}}{P_t}$ (Attachment MEE-9).

have stabilized. For example, S&P Global Market Intelligence Pro (GMI) reports both 1- and 3-year unadjusted betas using simple, price-only, daily absolute returns.[93] As of January 7, 2022, the unweighted average 1-year beta for the UPG, which does not include the volatile period, was 0.55; the average 3-year beta, which does include the volatile period, was 0.89. For comparison, Yahoo! Finance and Zacks Investment Research report 5-year unadjusted betas using simple price-only, monthly absolute returns. Yahoo! Finance's and Zacks's averages on the same day were both 0.34.[94]

Figure 14 plots the utility sector raw beta using 1-, 2-, and 5-year trailing histories of simple weekly absolute returns from June 1926 through December 2021. At any given time, beta can be very sensitive to the trailing history used. As of the end of December 2021, the betas using the 1-, 2-, and 5-year trailing histories were 0.45, 1.01, and 0.81, respectively.

[93] Personal correspondence with S&P Global Market Intelligence (November 2021).
[94] S&P GMI; Yahoo! Finance; Zacks.

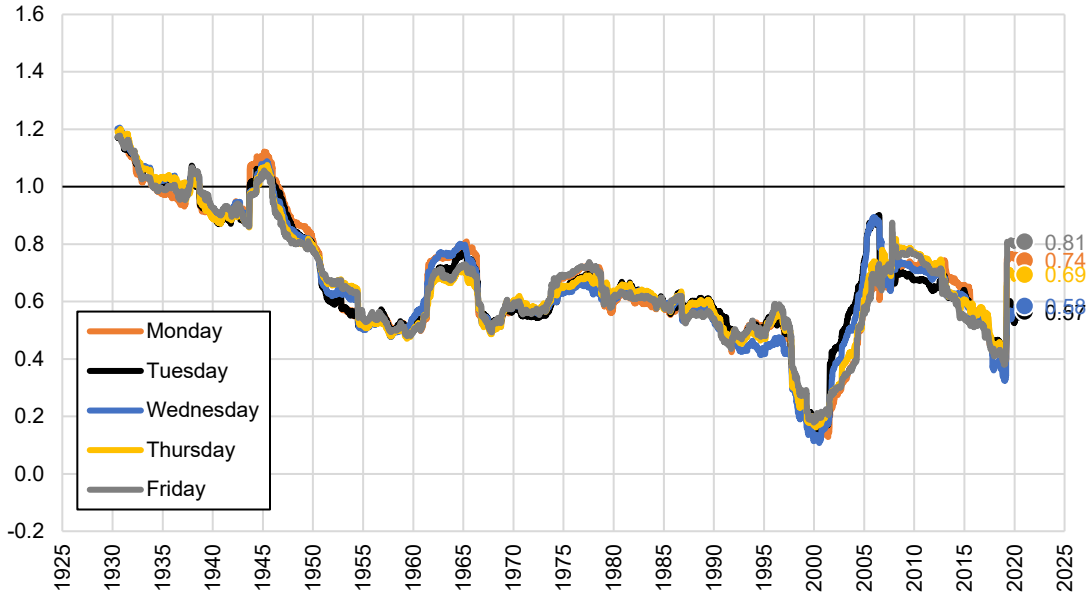
Figure 14. Utility sector trailing raw beta – trailing history sensitivity[95]
July 1926-December 2021



Even something as arbitrary as the day of the week on which weekly returns are calculated can materially affect the beta estimate. Figure 15 shows the 5-year trailing beta, i.e., raw Value Line-equivalent, with returns calculated on each weekday. Currently, Friday yields the highest beta, 0.81, but simply changing the calculation day to Tuesday reduces the beta to 0.57, 30% lower. This effect is only partially mitigated by averaging multiple utilities. The same analysis using the unweighted average of the UPG members yields betas ranging from 0.49 to 0.69.[96] These findings further highlight the need for caution in using the mechanically calculated betas provided by Value Line, Bloomberg, and other financial data providers.

[95] M. Ellis analysis of French Data Library (FDL) data; available at: https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html.
[96] M. Ellis analysis of S&P GMI data.

Figure 15. Utility sector 5-year weekly trailing beta – return calculation day sensitivity[97]
July 1926-December 2021



Q. What is the third major source of discrepancy in data providers' beta estimates?

A. The third major source of discrepancy in data providers' beta estimates is whether they use the Blume adjustment.[98] The Blume adjustment is frequently used to correct for raw betas' tendency, on average, to regress toward the market mean, 1.0, over time.

Q. What is the origin of the Blume adjustment?

A. The Blume adjustment is based on an analysis by Marshall Blume in the early 1970s using beta-sorted portfolios that found a tendency for betas, on average, to regress toward the

[97] M. Ellis analysis of French Data Library (FDL) data; available at: https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html.

[98] The other listed adjustments are more commonly found in academic research, although the data provider CRSP reports Scholes-Williams betas, and S&P Global Market Intelligence allows users to calculate beta using the Vasicek adjustment.

market mean of 1.0 from one time period to the next.[99] To compensate for this tendency, he recommended adjusting the raw beta based on a relationship derived from a regression of current betas against past betas. "Adjusted" beta is a weighted average of the raw beta and the market beta (1.0).

The most common weighting is 2/3 on the raw beta, 1/3 on the market beta (1.0), basically shifting the raw beta one-third of the way toward 1.0. Bloomberg uses these weights to calculate its adjusted beta. Value Line's weights are 0.67 and 0.35, respectively. Value Line also rounds to the nearest 0.05.[100]

Q. Does Blume's finding apply specifically to utilities?

A. The Blume adjustment is based on an observation of the tendency of betas, *on average*, to regress toward 1.0. Blume's analysis used beta-sorted portfolios, i.e., groups of stocks sorted by beta.

Blume did not look at portfolios sorted on other criteria, such as industry, but others have. Mr. D'Ascendis's former colleague and co-developer of the PRPM, Richard Michelfelder, investigated the validity of the beta adjustment specifically for utility stocks and found no evidence of the tendency observed by Blume in beta-sorted portfolios.[101] This can be observed in Figure 14 and Figure 15, as well. Since the 1950s, the beta for the utility sector as a whole has tended to regress toward 0.55-0.60, not 1.0.[102]

[99] Blume, "On the Assessment of Risk," *The Journal of Finance*, 26:1 (March 1971), pp. 1-10.
[100] Data request response Staff 2-46 Attachments 2 and 3 (Attachment MEE-9).
[101] Michelfelder, Theodossiou, "Public Utility Beta Adjustment and Biased Costs of Capital in Public Utility Rate Proceedings," *The Electricity Journal*, 29:9 (November 2013), pp. 60-68.
[102] One might ask whether the utility sector average reflects the tendency of individual utility stocks. Betas are additive, so a tendency for individual utility stocks to regress toward 1.0, on average, would be reflected in the industry beta. Blume used the same logic to extrapolate from the portfolios he analyzed to individual stocks. See Fama, French, "The Capital Asset Pricing Model: Theory and Evidence," *Journal of Economic Perspectives*, 18: 3 (Summer 2004), p. 31.

Blume speculated as to why betas, on average, tend to regress toward 1.0 over time.[103] High-beta firms tend to be newer and smaller; as they mature and grow, they become more risk-averse. In contrast, low-beta firms tend to run out of low-risk investment opportunities and must accept more risk to stay in business. Neither of these applies to utility operating companies, whose investments tend to have consistent risk profiles over time, regardless of firm size or maturity.

Over the last two-plus decades, utility betas have varied more around the long-term average of 0.55-0.60, likely attributable to their entry, and subsequent exit, from various unregulated lines of business. Even over this period, though, the average beta has remained in this range and was trending below it prior to the covid-related market turmoil in early 2020. In summary, there is no basis for applying the Blume adjustment to utility betas.

Q. Given that betas are so sensitive to the trailing calculation period, how should we estimate beta?

A. The variation in the three most recent beta estimates in Figure 14 suggests we should not simply mechanically average the most recent trailing betas from various data providers, as Mr. D'Ascendis does. It's important to keep in mind that all methodologies are intended to produce *estimates of investors' future expectations*. The elevated current 2- and 5-year betas are artifacts of arbitrary choices of calculation period; there is no reason to believe they reflect investors' current long-term expectations.

I will return to this topic when I discuss my recommended approach. For now, it should be recognized that the betas used by Mr. D'Ascendis are inflated because they are (1) Blume-

[103] Blume, "Betas and Their Regression Tendencies," *The Journal of Finance*, 30:3 (June 1975), pp. 785-795.

adjusted and (2) incorporate an anomalous period that does not reflect investors' *current, long-term* expectations.

3. Market risk premium

Q. Let's turn to the last component of the CAPM. How does Mr. D'Ascendis estimate the market risk premium?

He uses the same four models used in the total market approach RPM: historical average, regression, PRPM, and DCF.

Q. How is the market risk premium estimated from the historical average?

A. This market risk premium model is the most straightforward: the historical difference between the market and Treasury benchmarks. Nonetheless, there are three flaws in Mr. D'Ascendis's implementation of this seemingly simple analysis. First, the average returns cited are arithmetic, not geometric. Second, he uses income-only, not total, bond returns. Third, the premium should be calculated using real, not nominal, returns.

Previously, I described the difference between arithmetic and geometric returns, how arithmetic returns are always greater than or equal to arithmetic, and that for any given future geometric return, there is only one future investment value. In contrast, for any given arithmetic return, there is an infinite number of potential future outcomes, so the arithmetic return is a poor indicator of investor expectations. I concluded that the geometric return is a better indicator of future investor expectations. I'd like to explain this in more detail.

Q. Why are geometric returns a better indicator of future investor expectations?

A. The choice between arithmetic and geometric returns for estimating investor expectations has been hotly debated among academics and practitioners for decades. Some of the disagreement arises from differences in potential application. For example, in portfolio management, where Monte Carlo simulation is common, arithmetic averages, in combination with return distributions, are appropriate. In corporate finance and valuation, which is more analogous to our objective, the choice depends on the life of the investment under consideration. The widely used finance text *Valuation* summarizes the current status:[104]

> The choice of averaging methodology will affect the results. For instance, between 1900 and 2014, U.S. stocks outperformed long-term government bonds by 6.4 percent per year when averaged arithmetically. Using a geometric average, the number drops to 4.2 percent. This difference is not random; arithmetic averages always exceed geometric averages when returns are volatile.
>
> So which averaging method on historical data best estimates the expected rate of return? Well-accepted statistical principles dictate that the best unbiased estimator of the mean (expectation) for any random variable is the arithmetic average. Therefore, to determine a security's expected return for one period, the best unbiased predictor is the arithmetic average of many one-period returns. A one-period risk premium, however, can't value a company with many years of cash flow. Instead, long-dated cash flows must be discounted using a compounded rate of return. But when compounded, the arithmetic average will generate a discount factor that is biased upward (too high).
>
> There are two reasons why compounding the historical arithmetic average leads to a biased discount factor. First, the arithmetic average may be measured with error. Although this estimation error will not affect a one-period forecast (the error has an expectation of zero), squaring the estimate (as you do in compounding) in effect squares the measurement error, causing the error to be positive. This positive error leads to a multiyear expected return that is too high. Second, a number of researchers have argued that stock market returns are negatively autocorrelated over time. If positive returns are typically followed by negative returns (and vice versa), then squaring the average will lead to a discount factor that overestimates the actual two-period return, again causing an upward bias.

[104] Koller, et al, *Valuation*, 6th ed., p. 853.

Valuation goes on to recommend a widely used weighted average of the geometric and arithmetic averages, weighted more heavily toward arithmetic for short-lived investments, converging toward the geometric average if the investment life equals or exceeds the duration of the historical time series from which the averages are calculated.

NYU finance professor Aswath Damodaran, known for his simple, practical advice to practitioners, reaches a similar conclusion:[105]

> As we move to longer time horizons, and as returns become more serially correlated (and empirical evidence suggests that they are), it is far better to use the geometric risk premium. In particular, when we use the risk premium to estimate the cost of equity to discount a cash flow in ten years, the single period in the CAPM is really ten years, and the appropriate returns are defined in geometric terms. In summary, … the geometric mean is more appropriate if you are using the Treasury bond rate as your risk-free rate, have a long time horizon, and want to estimate the expected return over that long time horizon.

In utility cost of capital proceedings, we are estimating the cost of equity. Equity is a claim on cash flows into perpetuity, i.e., the investment life is infinite, which dictates using a long-term risk-free rate, as is common practice, and the geometric average. The geometric average is also consistent with the results of the DCF model, which produces a continuously compounded, i.e., geometric, average estimated return.

Q. What is the second flaw in Mr. D'Ascendis's calculation of his historical risk premia?

A. The second flaw is his use of only the income component (yield) of long-term bond returns, not capital gains and reinvestment. The analysis uses annual returns, but the long-term bond yield by itself is almost never realizable over a one-year period, as there will be capital gains

[105] http://people.stern.nyu.edu/adamodar/New_Home_Page/AppldCF/derivn/ch4deriv.html.

or losses as interest rates change.[106] The large-cap and utility equity proxies include the *total* return: income (dividends), capital gains/losses, and reinvestment; the bond proxy should, as well.

Q. What is the third flaw in Mr. D'Ascendis's calculation of his historical average risk premia?

A. Historical equity risk premia should be calculated using real, not nominal returns, and then adjusted for expected future inflation. Historical inflation averaged 2.93%, while current expected long-term inflation is 2.28%. Failing to adjust for the difference between historical and forecast inflation inflates the resulting risk premia by a factor of $\frac{1+i_{historical}}{1+i_{forecast}}$.

Q. Please explain Mr. D'Ascendis's regression model for estimating the risk premia.

A. In the regression model, the equity risk premium is expressed as a function of the bond yield:

$$r_e - r_b = \alpha + \beta r_b + \varepsilon$$

where r_e and r_b refer to the returns on equity (large cap or utility index), α and β are the regression coefficients, and ε is estimation error. Rearranging terms, the model can be expressed more simply as:

$$r_e = \alpha + \beta r_b + r_b + \varepsilon = \alpha + \beta' r_b + \varepsilon$$

In other words, the risk premium regression model is simply a regression of equity returns against bond returns.

[106] Although it is possible to invest to achieve only the yield by holding a bond to maturity, few investors do so, and it is unrealistic to assume the returns so achieved are representative of a typical investor or the market as a whole.

With any regression model, we always want to assess the validity and statistical robustness of the relationship being modeled. Mr. D'Ascendis's regression model fails on both counts.

The causal relationship being modeled is the influence of the bond yield on the equity risk premium. To estimate this relationship, i.e., the regression coefficients, Mr. D'Ascendis regresses the trailing 12-month realized total equity return (including dividends and capital gains) less the current bond yield against the current bond yield. As explained above, since the current bond yield is on both sides of the equation, the relationship could equivalently be estimated by simply regressing the trailing 12-month realized total equity return against the current bond yield.

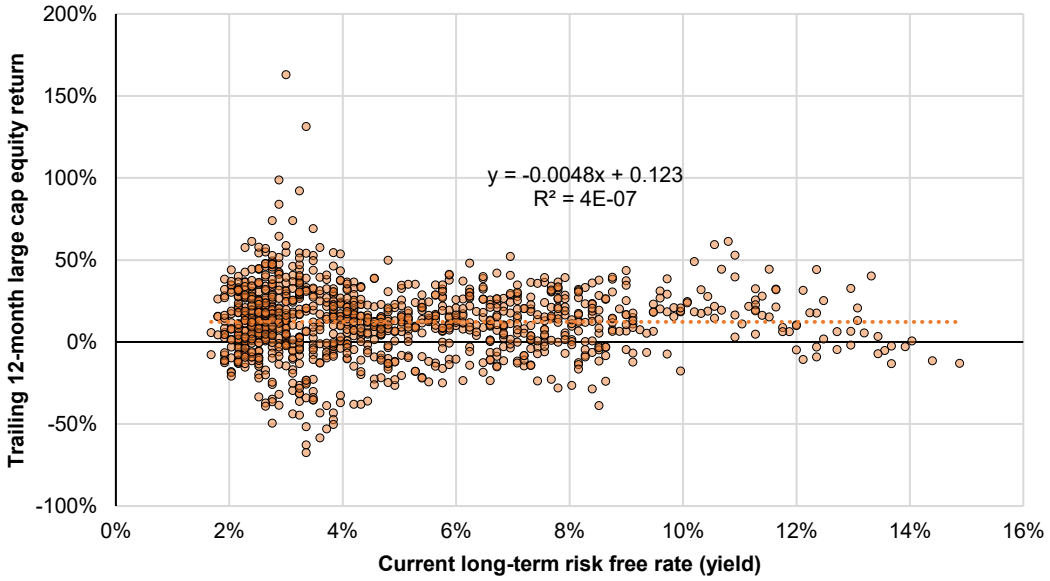
This is clearly not a valid causal relationship. The dependent variable, the trailing 12-month realized return, largely occurs *earlier* in time than the dependent variable, the current bond yield. It is simply implausible, for example, that the returns from January through November of 2020 are influenced in any way by bond yields in December 2020.

Given this implausible causality, the relationship between these two time series is not expected to be strong. As can be seen in the cross-plot in Figure 16, it is no better than random. In this example, the long-term Treasury bond yield explains only 0.00004% of the variation in (mostly prior) large cap equity returns, and the slope coefficient is not statistically meaningful.[107] Similar results are obtained for the other risk premia regressions, large cap vs. Aaa/Aa2-rated corporate bonds and utilities vs. A2-rated public utility bonds.[108]

[107] T-statistic: -0.0205; p-value: 0.983.

[108] Mr. D'Ascendis regresses the difference between the trailing equity return and bond yield against the bond yield. Because the independent variable is on both sides of the equation, the resulting R^2 coefficients are higher, but bond yields still explain less than 2.5% of the variation in the risk premium. In data request response DOE 4-1a, Mr. D'Ascendis defended his regressions by pointing to slope coefficient t-statistics significantly different from 0. (Attachment MEE-10). He appears not to realize that the null hypothesis for a regression in which an

Figure 16. Trailing 12-month large cap equity return vs. long-term risk free yield[109]
January 1926-December 2019



Even if the causal relationship is modified to something more plausible, say the relationship between the yield and the subsequent twelve months' return, the statistical significance remains low, with long-term Treasury bond yields explaining only 0.13% of the variation in large cap stock returns and a statistically insignificant slope coefficient.[110] This lack of statistical significance explains why single-factor regression models are typically not used to estimate the CAPM market risk premium. The flatness of the regression line, low R^2 coefficient, and low statistical significance of the slope coefficient indicate that the long-term historical average is a better estimate.

independent variable is on both sides of the equation is the coefficient of that variable on the dependent side, here -1. None of the coefficients is significantly different from -1.

[109] M. Ellis analysis of Ibbotson data via data request response OCA 1-1 Attachment 1, tab MRP ERP WP (Attachment MEE-7).

[110] T-statistic: 1.217; p-value: 0.224.

The regression model for estimating the risk premium suffers other deficiencies. As in the historical analysis, only bond yields, not total returns, are used. Because it is fit to annualized returns, it produces the equivalent of an arithmetic, not geometric, result. While these deficiencies could be addressed, its lack of statistical validity disqualifies it from use.

Q. What is Mr. D'Ascendis's third method for estimating the two risk premia?

A. His third method is the PRPM. As explained above, the PRPM suffers numerous errors and deficiencies that disqualify it from use. Any CAPM inputs based on this model should be disregarded.

Q. What is Mr. D'Ascendis's fourth method for estimating the two risk premia?

A. His fourth method is the same constant-growth DCF model used to estimate the COE for each of the UPG members. Here, he calculates separate, using Bloomberg and Value Line data, market capitalization-weighted average COEs for the members of the S&P 500 and Utilities Indexes. As explained above, the CG DCF's main shortcoming is the assumption that analysts' three-to-five-year growth estimates can be sustained into perpetuity. His results are therefore significantly upwardly biased and should be disregarded.

4. Empirical CAPM

Q. Does Mr. D'Ascendis make any adjustments to his CAPM results?

A. Yes. He averages them with the results of the Empirical CAPM, or ECAPM.

Q. What is the ECAPM?

A. The ECAPM was developed by utility cost of capital consultant Roger Morin. It is based on the empirical observation in various academic studies that low-beta stocks tended to perform better than predicted by the CAPM, and high-beta stocks worse, resulting in a "flattened" security market line (SML), the relationship between beta and return. It modifies the traditional CAPM as follows:[111]

$$k = r_f + 0.25(r_m - r_f) + 0.75\beta(r_m - r_f)$$

Mathematically, the effect of the ECAPM is similar to the Blume beta adjustment, further adjusting beta toward 1.0 by a factor of 0.25.

Q. Is the ECAPM widely used?

A. The ECAPM is used only in utility cost of capital proceedings, particularly by experts testifying on behalf of utilities. It is not used elsewhere. No papers validating or endorsing the ECAPM have been published in any peer-reviewed journals, and it is not included in commonly used finance textbooks for students and corporate finance professionals. It is mentioned only in utility-focused practitioner guides, most notably Mr. Morin's own books.

Q. Is the ECAPM valid for estimating the long-term cost of equity for a utility?

A. The ECAPM is not valid for estimating the long-term cost of equity for a utility, because the academic studies on which it is based are not analogous to how the CAPM is implemented in utility cost of capital proceedings. There are two important differences.

[111] DWD, pp. 30-31.

First, the academic studies cited in support of the ECAPM all use a short-term risk-free rate; utility rate case CAPM COEs typically use a long-term risk-free rate, as we are here. Using a long-term rate implicitly flattens the SML – the risk-free rate is higher, while the market return is unchanged. Because the ECAPM is based on the observation of a flattened slope relative to a short-term rate, it over-compensates.

Second, the academic studies do not examine utilities specifically. As we saw with beta, utilities' regulatory model can affect the behavior of their equity returns relative to the market. When these studies' analyses are re-run using a long-term risk-free rate, the "flatness" in the SML largely disappears for the market as a whole, and completely disappears for utilities.[112]

Figure 17 shows the Fama-French (FF) study cited by Mr. D'Ascendis,[113] which regresses the monthly annualized absolute returns of beta-sorted portfolios against realized beta,[114] overlaid by a replication using the 30-year Treasury instead of the original study's 1-month T-bill and adding the utility index. The data are from March 1977, the earliest complete month of data for the Treasury, through December 2021. While the beta-sorted portfolios lie slightly above the SML, their regression slope and intercept coefficients are not

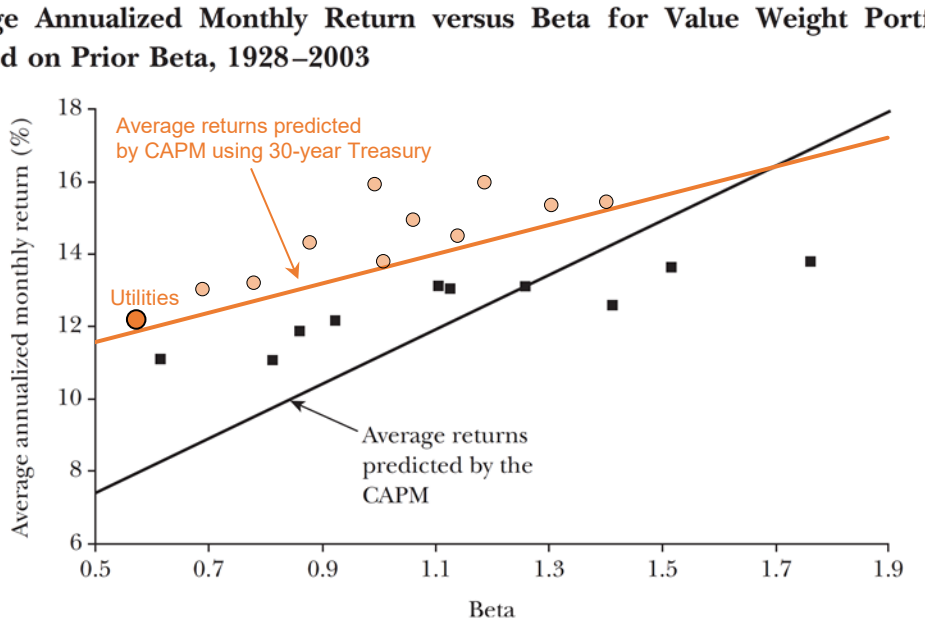
[112] In substituting a long-term Treasury for a short-term risk-free rate, as is typically done in utility cost of capital analyses, analysts are implicitly adopting the zero-beta CAPM developed by Fisher Black, co-creator of the Nobel Prize winning Black-Scholes option pricing equation. This more general version of the CAPM does not require the existence of a risk-free rate (over the long term, the short-term rate is not risk-free, as investors are exposed to inflation and reinvestment risk; the long-term rate is subject to inflation if held to maturity and capital gains or losses due to interest rate changes if not), just an investable asset or portfolio with a beta equal to zero. Long-term government bonds meet this criterion.

[113] DWD, p. 29.

[114] In the replication, realized betas are calculated using excess returns, per the specification of the CAPM model, $k = r_f + \beta(r_m - r_f) + \varepsilon$. It is not clear whether Fama and French use excess or absolute returns to calculate beta.

statistically significantly different than the SML's (t-statistics of 0.412 and 1.170, respectively).[115] The utilities follow the relationship predicted by the CAPM.

Figure 17. Original Fama-French absolute return analysis and replication (March 1977-December 2021) using T30[116]



Another classic test of the CAPM comes from Black, Jensen, and Scholes (BJS).[117] They regress monthly *excess* returns against beta. While BJS's regression returned an intercept and slope statistically significantly different from the SML's, these coefficients are not

[115] The t-statistic is the ratio of the departure of the estimated value of a parameter from its hypothesized value to its standard error. In regression models, t-statistics above 2.0 suggest the null hypothesis, here that the regression slope and intercept are equal to the SML's, is not valid. The t-statistics of the recreated Fama-French analysis are both well below 2.0, indicating that the regression line of the portfolios against their betas is not statistically different than the SML.

[116] Fama, French, "The Capital Asset Pricing Model: Theory and Evidence," *Journal of Economic Perspectives*, 18:3 (Summer 2004), pp. 32-33. Beta-sorted and industry portfolios from French Data Library (https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html). Betas are calculated using simple monthly excess returns.

[117] Black, Jensen, Scholes, "The Capital Asset Pricing Model: Some Empirical Tests," in Jensen, *Studies in the Theory of Capital Markets*, (1972), pp. 79–121.

significantly different when their analysis is repeated with the 30-year Treasury.[118] As with the Fama-French analysis, utilities fall almost exactly on the SML.

Figure 18. Original BJS excess return analysis and replication (March 1977-December 2021) using T30[119]

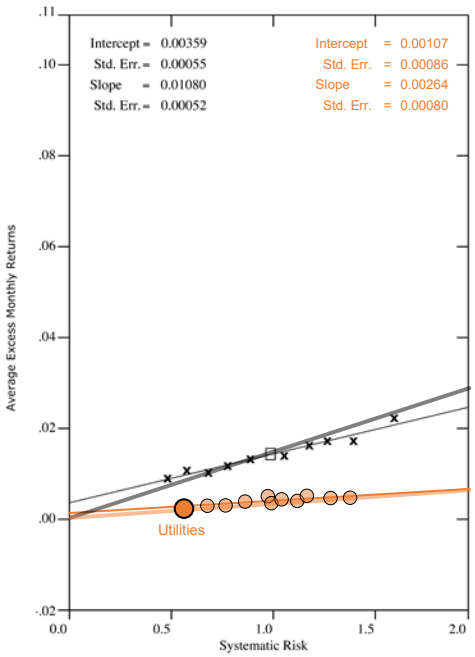


Figure 1 Average excess monthly returns versus systematic risk for the 35-year period 1931-65 for each of ten portfolios (denoted by ×) and the market portfolio (denoted by ☐).

Despite its name, there is no empirical support for using the ECAPM to estimate the long-term cost of equity in utility regulatory proceedings.

[118] Intercept t-statistic (H_0: 0): 1.251, slope t-statistic (H_0: SML slope): 0.498; comparable values for BJS are 6.52 and 6.53, respectively.

[119] Black, Jensen, Scholes, "The Capital Asset Pricing Model: Some Empirical Tests," in Jensen, *Studies in the Theory of Capital Markets* (1972), pp. 79–121. Beta-sorted and industry portfolios from French Data Library (https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html). Betas are calculated using simple monthly excess returns.

5. CAPM conclusion

Q. What is your overall assessment of the CAPM and Mr. D'Ascendis's implementation of it?

A. The CAPM is conceptually sound and one of the most widely-used COE models in corporate finance. But Mr. D'Ascendis's implementation – use of a forecast, not current, risk-free rate; a mechanically calculated adjusted beta that is not reflective of current market conditions or utilities' long term risk profile; MRP models flawed in their conception and/or application; and averaging with the ECAPM – yields systematically upwardly biased results. His CAPM model results should be disregarded.

H. ADJUSTMENTS

Q. How does Mr. D'Ascendis adjust his COE model results?

A. He makes two adjustments, for size and flotation cost.

Q. Are these adjustments warranted?

A. Neither is warranted. His rationales for them are not valid empirically or logically.

1. Small size

Q. What is Mr. D'Ascendis's rationale for the small size adjustment?

A. Mr. D'Ascendis's rationale for the small size adjustment is based on three arguments. First, Aquarion's cost of equity is higher because small size is inherently more risky, and more risk entails a higher cost of equity. Second, the higher risk of small size is confirmed by academic research finding a public equity "small size effect" in which stocks with a lower market

capitalization earn returns higher than can be explained by beta alone. Third, because Aquarion's cost of equity should be considered on a standalone basis, it is appropriate to add a small size premium as if it traded on its own.[120]

Q. Is Mr. D'Ascendis's small size adjustment valid?

A. No, it is not.

Q. What is wrong with it?

A. Like so many of his other analyses, his size adjustment is flawed in both concept and implementation. I will start with the implementation.

Mr. D'Ascendis adjusts his final COE result using a model ostensibly based on the empirical historical relationship between publicly-traded company size and return in excess of what can be explained by beta. If such an effect did, in fact, exist, it would apply only to his CAPM results, not to the results of his other models. For those, he would need another way to estimate the relationship between size and return-above-model; he does not provide one.[121] Also, Mr. D'Ascendis already adjusts his CAPM results for beta not completely explaining returns with the ECAPM. To the extent that some low-beta stocks are also small, whatever small size effect exists is at least partly captured in the ECAPM, so the small size adjustment is double-counted.

[120] DWD, pp. 38-44.
[121] As far as I know, there is no research, for example, on small stocks' returns in excess of what is predicted by the DCF or RPM.

Q. What is wrong with the small size adjustment conceptually?

A. None of his three arguments in support of it is valid.

Q. If small size is inherently more risky, why doesn't it entail a higher cost of capital?

A. Mr. D'Ascendis argues that "smaller companies generally are less able to cope with significant events that affect sales, revenues, and earnings" and this greater risk entails a higher cost of equity.

As discussed previously, it is not total risk that determines the cost of equity, but *non-diversifiable* risk. Investment size is an easily diversified risk factor and, in Aquarion's case, any potential size-related risk has already been diversified by its ownership by the much larger Eversource. Even when considered on a standalone basis, whoever invests in Aquarion can easily diversify its small-size risk by investing in the broader stock market.

Q. What's wrong with the research on the public equity small size effect?

A. First, none of the research on the size effect cited by Mr. D'Ascendis is utility-specific. Where researchers have investigated the size effect in utilities specifically, they have not been able to find one.[122]

Second, all of the research cited by Mr. D'Ascendis is on publicly traded stocks, not the subsidiaries of publicly traded companies. Even if the findings are true and apply to utilities, whether they apply to subsidiaries is unknown.

[122] Wong, "Utility stocks and the size effect: an empirical analysis," *Journal of the Midwest Finance Association* (1993), pp. 95-101.

Third, the research cited by Mr. D'Ascendis is several decades old. As explained by Cliff Asness, founder of factor investing pioneer AQR Capital Management,[123] recent research has concluded, "the simple small firm effect doesn't exist, as small firms do not historically defeat large ones by more than their market beta."[124] He continues:

> A series of cumulative challenges … all have reduced the historic "net of market beta" return to small vs. large, ultimately leaving nothing. Two of the main ones are 1) the original results, through no fault of their own, exaggerated the size effect as the databases at the time overstated the returns to small stocks. You get a smaller size premium today if you run the exact same tests over the exact same databases (updated and improved to fix errors, many of which were more common among small stocks) over the exact same time periods as the original work. And 2) the apparent outperformance of small versus large caps after adjusting for market beta in the original work was biased by misestimated betas due to liquidity differences. Accounting for this misestimation removes the last vestige of a size effect.

In the words of the "Dean of Valuation," NYU finance professor Aswath Damodaran, the size effect is "fiction."[125]

Finally, in the discussion of the ECAPM above, the re-created FF and BJS analyses demonstrated that under the zero-beta CAPM using a long-term risk-free rate, beta is sufficient to explain the variation in returns, particularly for utilities.

[123] "Factor investing is an investment approach that involves targeting quantifiable firm characteristics or 'factors' that can explain differences in stock returns. Security characteristics that may be included in a factor-based approach include *size*, low-volatility, value, momentum, asset growth, profitability, leverage, term and carry" [emphasis added]. https://en.wikipedia.org/wiki/Factor_investing.

[124] Asness, "There Is No Size Effect" (September 2020), p. 2; available at: https://www.aqr.com/Insights/Perspectives/There-is-No-Size-Effect-Daily-Edition.

[125] https://www.bvresources.com/articles/bvwire/size-effect-is-fiction-damodaran-reiterates. Damodaran attributes the persistence of the use of the small size premium in corporate valuation to intuition, inertia, and bias. See Damodaran, "The Small Cap Premium: Where Is the Beef?" *Business Valuation Review*, 34:4 (2015), pp. 153-57.

Q. Should Aquarion be considered on a standalone basis?

A. Aquarion's cost of capital should be considered on a standalone basis, commensurate with its own risk profile. But Mr. D'Ascendis's argument that small size, in and of itself, is a risk factor that should be reflected in individual investments' cost of capital is logically flawed.

Mr. D'Ascendis provides several textbook passages that make the valid point that individual investments should be evaluated at their respective costs of capital, reflecting their specific risk profiles, including the following from Levi and Sarnat:[126]

> The firm's cost of capital is the discount rate employed to discount the firm's average cash flow, hence obtaining the value of the firm. It is also the weighted average cost of capital, as we shall see below. The weighted average cost of capital should be employed for project evaluation… only in cases where the risk profile of the new projects is a "carbon copy" of the risk profile of the firm.

Clearly, though, the smaller size of individual investments does not, by itself, change the cost of capital relative to the investing firm. If it did, why would "carbon copy" projects, which of necessity are smaller than the investing firm, have the same cost of capital?[127]

The entire premise of estimating a corporate cost of capital falls apart if successively smaller investments require increasing costs of capital. Under the value additivity principle, any single investment is the sum of its parts; investing in new meters for an entire utility is equivalent to multiple investments in a single meter for each customer.[128] Yet, under Mr. D'Ascendis's logic, the cost of capital for each single meter would be much higher than for all the meters, which, in turn, would be higher than the utility's. It would be impossible to identify the appropriate cost of capital for any investment.

[126] Levy, Sarnat, *Capital Investment and Financial Decisions* (1986), p. 465, as cited in DWD, p. 41.
[127] It might be argued that a carbon copy project is one whose risk profile matches the investing firm's *after* adjusting for the project's size effect. A size adjustment for individual projects is not mentioned in any of the finance texts cited by Mr. D'Ascendis.
[128] See, for example, Brealey, Myers, Allen, *Principles of Corporate Finance*, 10th ed. (2011), p. 178.

Q. How has the Commission treated utilities' proposed ROE adjustment for their small size in the past?

A. The Commission has previously denied utilities' requested ROE small-size adjustments, in 2013,[129] 1991,[130] and 1985.[131]

2. Flotation cost

Q. What is Mr. D'Ascendis's rationale for the flotation cost adjustment?

A. His rationale is that Aquarion's parent company, Eversource, incurs real costs to raise equity in public markets, in the form of underwriting fees that reduce the net proceeds from any issuance of equity; investors should be compensated for these costs.

Q. Is the flotation cost adjustment justified?

A. No, it is not justified, for several reasons.

Mr. D'Ascendis's premise that investors in Aquarion's parent should be compensated for flotation costs conflicts with the valid "standalone" premise that he (erroneously) invoked in support of the size adjustment. If Aquarion is to be treated on a standalone basis, which it should, how the parent funds its equity investment, and any costs incurred, are simply not relevant. For example, Aquarion could be funded entirely by its own retained earnings or owned by a private company or pension fund that does not incur issuance costs. Similarly, funds might be raised inefficiently; why should customers bear that burden?

[129] *Aquarion Water Company of New Hampshire*, Order No. 25,539 (2013).
[130] *Southern New Hampshire Water Company*, Order No. 20,196 (1991).
[131] *Pennichuck Water Works, Inc.*, Order No. 17,911 (1985).

If the Commission does decide that investors in Aquarion's parent should be allowed to recover flotation costs, it is necessary only if investors are not otherwise compensated for them. As explained in the chapter from Morin's *New Regulatory Finance* cited by Mr. D'Ascendis, if the issuer's market-to-book ratio (M/B) is greater than 1/(1 – flotation cost), new equity issuance is accretive, i.e., provides a premium over the cost of capital, including flotation costs.[132] Mr. D'Ascendis estimates a flotation cost of 2.14% of gross equity issuance,[133] so as long as Eversource's M/B is above 1/(1 – 2.14%) = 1.022, accretion from new equity issuance compensates investors for flotation costs. As of December 31, 2021, Eversource's M/B is 2.17 and has been above 1.022 for over a decade.[134] Any flotation cost adjustment would merely further enrich shareholders at customers' expense.

Mr. D'Ascendis's flotation cost adjustment is small, 0.04%, and is overwhelmed by the imprecision in his various models – less than one-half the difference between the medians and means of his various COE models, for example.[135] To add it is akin to the elementary school student, who, upon being asked what they learned during a field trip to the science museum, proudly says, "Earth is 4.5 billion years and [glancing at a clock] six hours and forty-three minutes old."

[132] Morin, *New Regulatory Finance* (2006), pp. 330-33.
[133] Attachment DWD-10, p. 1.
[134] S&P Global Market Intelligence.
[135] Attachments DWD-3, p. 1; DWD-4, p. 2; DWD-5, p. 1; DWD-7, pp. 1, 2, 6.

Q. How has the Commission treated utilities' proposed ROE adjustment for flotation costs in the past?

A. The Commission has previously denied utilities' requested ROE flotation cost adjustments, in 2009,[136] 2005,[137] and 1985.[138]

I. OTHER CONCERNS

Q. Do you have any other concerns with Mr. D'Ascendis's analysis.

A. An additional, albeit not material, concern is his use of the average of the mean and median for the final result in several of his models. The mean is generally accepted as the best unbiased estimator of the expected value of any random variable, because it includes all the values in the data set for its calculation, and any change in or addition to those values will affect the mean. The median is typically used only when there is a concern that outliers or a skewed distribution may distort the mean such that it no longer reflects the expected value.[139]

Mr. D'Ascendis's use of the median is inconsistent and duplicative. He uses it only for his final model results,[140] but not for intermediate results, such as his estimates of the equity and market risk premia.[141] He already excludes outliers from the mean and median calculations,[142] and he presents no evidence that the return distribution is skewed, so there is no basis for using the median.

[136] *EnergyNorth National Gas, Inc.*, Order No. 24,972 (2009).
[137] *Public Service Company of New Hampshire*, Order No. 24,473 (2005).
[138] *Pennichuck Water Works, Inc.*, Order No. 17,911 (1985).
[139] https://statistics.laerd.com/statistical-guides/measures-central-tendency-mean-mode-median.php.
[140] Attachments DWD-3, p. 1; DWD-4, p. 2; DWD-5, p. 1; DWD-7, pp. 1-2, 6.
[141] Attachments DWD-4, p. 8 (ERP); DWD-5, p. 2 (MRP).
[142] Attachment DWD-4, p. 2.

Curiously, the median is lower than the mean in most of his calculations – one of the few instances where an error leads to a lower ROE estimate.[143]

J. CRITIQUE CONCLUSION

Q. What is your overall assessment of Mr. D'Ascendis's rate of return analysis?

A. Mr. D'Ascendis's rate of return analysis is rife with errors, in both concept and implementation. The numerous constituent analyses are unnecessarily complicated, redundant, and inconsistently implemented. At virtually every opportunity, his methods and assumptions introduce upward bias in his final result.

As component parts of a holistic assessment, their substantial overlap in both methodology and data is an additional infirmity. For example, the novel PRPM, which tends to produce the highest results, is used repeatedly throughout the assessment – first for the Utility Proxy Group as (1) half of the risk premium model on a standalone basis; (2) to develop one of the risk premia used in the second half of the RPM; and (3) for one of the CAPM MRPs – and then again for the same purposes with the Non-Price Regulated Companies. Similarly, the same historical time series data are used repeatedly in the PRPM, RPM, and CAPM, and the same betas in both the total market approach RPM and the CAPM. Intermingling methodologies and data in this manner sacrifices the constituent analyses' independence; to the extent there are errors or biases, they propagate throughout his analysis. Rather than canceling out as intended in a composite approach, they compound.

I am not the first to reach such a conclusion about Mr. D'Ascendis's rate of return methodology and implementation. In a recent water utility rate case and subsequent appeal,

[143] Median lower than mean: Attachments DWD-3, p.1; DWD-4, p. 2; DWD-7, pp. 1-2. Median higher than mean: DWD-5, p. 1; DWD-7, p. 6.

both the South Carolina PSC and Supreme Court rejected Mr. D'Ascendis's testimony as lacking "analytical transparency" and "statistical coherence."[144] I believe the foregoing assessment demonstrates that Mr. D'Ascendis's testimony in this proceeding is likewise opaque and incoherent, and I recommend the New Hampshire Public Utilities Commission take similar action and reject his testimony in its entirety.

III. RECOMMENDED APPROACH

A. OVERVIEW

Q. Please provide an overview of your recommended approach.

A. Table 10 provides an overview of my recommended approach to estimating Aquarion's cost of capital. As explained above, the capital structure and ROE must be estimated jointly, because a utility's desired capital structure is determined to a large extent by its return on equity. At the same time, its return on equity is influenced by its capital structure (higher debt increases the cost of equity). Thus, they cannot be estimated in isolation but must be determined together. I use an integrated approach that does so.

I first estimate each UPG member's levered cost of equity under two different models, the multi-stage DCF and CAPM. I adjust for differences in capital structure across the peer companies to arrive at the average unlevered COE. The unlevered COE is then used in a model based on how rating agencies evaluate credit risk that solves for the capital structure and levered ROE that minimizes customer costs. The model incorporates a valuation

[144] *In re Blue Granite Water Co.*, 28055 (S.C. Sep. 1, 2021), p. 7.

component, to ensure the ROE is sufficient to attract equity investment, as well. Finally, the result return is adjusted to account for year-to-year variability in realized ROEs. This model ensures the interests of all key stakeholders – creditors, shareholders, and customers – are satisfied.

Table 10. Recommended Aquarion capital structure and rate of return

Component	Rate (%)	Weight (%)	Value ($)
Multi-stage discounted cash flow model	3.49%	50.00%	
Capital asset pricing model	3.52%	50.00%	
Unlevered cost of equity	3.50%		
Target credit rating	6.5		
Book equity ratio		57.32%	
Target M/B ratio		1.10	
Market equity ratio		59.64%	
Levered cost of equity	4.62%		
Market-to-book premium	0.23%		
Geometric to arithmetic adjustment	0.10%		
Book equity	4.95%	57.32%	20,705,212
Preferred stock	6.00%	0.01%	2,300
Short term debt	2.42%	3.32%	1,200,000
Existing long-term debt	6.47%	16.33%	5,900,000
New long-term debt	3.31%	23.01%	8,311,714
Total long-term debt	4.62%	39.35%	14,211,714
Rate of return	4.74%	100.00%	36,119,226

B. MULTI-STAGE DCF

1. Model overview

Q. What is the multi-stage DCF model?

A. The multi-stage DCF model is an enhancement on the CG DCF that allows for different dividend growth rates over time. As we saw previously, analysts' estimated 3-to-5-year growth rates are too high to be sustained in perpetuity, and may be biased, but that doesn't mean we should ignore them completely. They provide useful information about the relative expected growth across companies. Over the long-term though, it is reasonable to assume

investors expect growth rates, in real terms, to revert to their long-term historical trends. The MS DCF explicitly models different growth rates over time.

The MS DCF can incorporate any number of stages. For equity valuation, a three-stage model is commonly used, in which the initial stage uses analysts' estimates over their 3-to-5-year forecast horizon, and the terminal stage uses the long-term real historical growth rate plus current long-term inflation expectations. In between is a transition phase, typically 5 to 15 years, in which the growth rate is the simple average of the initial and terminal rates. The MS DCF model can be expressed as:

$$1 = d\frac{1+g_1}{k-g_1}\left(1-\left(\frac{1+g_1}{1+k}\right)^{t_1}\right) + d\left(\frac{1+g_1}{1+k}\right)^{t_1}\frac{1+g_2}{k-g_2}\left(1-\left(\frac{1+g_2}{1+k}\right)^{t_2}\right) + d\left(\frac{1+g_1}{1+k}\right)^{t_1}\left(\frac{1+g_2}{1+k}\right)^{t_2}\frac{1+g_3}{k-g_3}$$

where d is the current dividend yield; g_1, g_2, and g_3 are the initial, transition, and terminal growth rates, respectively (where $g_2 = \sqrt{(1+g_1)(1+g_3)} - 1$);[145] t_1 and t_2 are the initial and transition stage durations; and k is the cost of equity such that the equation is true. There is substantial precedent for the MS DCF model, in both its two- and three-stage forms, in corporate finance and regulatory contexts.[146]

For the UPG, I assume an initial growth stage of three years – the low end of analysts' EPS growth rate forecast horizon, to mitigate the effect of their upward bias – and a 10-year

[145] The geometric mean of g_1 and g_3 is used to ensure consistency between annual and quarterly versions of the model.

[146] See, for example, Brealey, Myers, Allen, *Principles of Corporate Finance*, 10th ed. (2009), pp. 83-88; Surface Transportation Board, "Use of a multi-stage discounted cash flow model in determining the railroad industry's cost of capital" (2009); available at: https://www.stb.gov/decisions/readingroom.nsf/WebDecisionID/39443?OpenDocument. FERC also uses a multi-stage DCF model, but it is a simplified version that substitutes a weighted average of the initial and terminal growth rates into the constant-growth DCF model. There are a number of problems with FERC's implementation of the MS DCF. It assumes a terminal growth rate equal to forecast GDP, not GDP per capita. The weights on the initial and terminal growth rates are not differentiated by company, as they would be in an exact model like the one described here. The composite rate is too heavily weighted toward the initial growth rate (75/25 initial/terminal); the exact DCF model can be used to demonstrate that the weights should be closer to 10/90.

transition. To account for the quarterly distribution of dividends, I convert the reported rates to quarterly and multiply the number of periods in the initial and transition phases by 4.[147] The dividend yield is the most recent quarterly dividend divided by the average price over December 2021.

2. Initial growth rate

Q. How do you estimate the initial growth rate for the UPG MS DCF?

A. I use an average of analysts' EPS growth estimates from S&P Global Market Intelligence (GMI), Yahoo! Finance, and Zacks plus a DPS growth rate estimated from Value Line's (VL) '24-'26 DPS forecast relative to dividends paid over the preceding 12 months.[148]

3. Terminal growth rate

Q. How do you estimate the terminal growth rate for the UPG MS DCF?

A. The terminal growth rate is intended to reflect a sector-wide dividend growth rate toward which all stocks in the peer group are expected to converge over time. The long-term historical average EPS growth rate of a proxy group, such as presented in Table 6, is typically not used to estimate a sector-average terminal growth rate. This is due to survivorship bias: the proxy group only includes companies that exist today, not those that failed or were acquired in the past. A sector-wide average should reflect the weighted average of all market participants, including those that were absorbed or declined out of existence. Because the proxy group is composed only of "survivors," the average of its

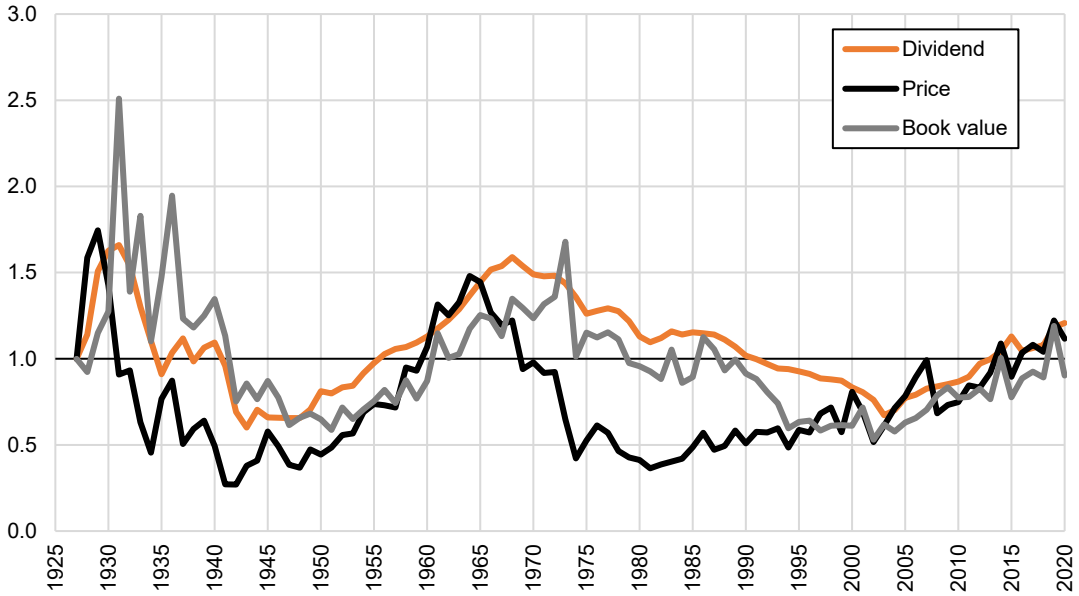
[147] All rates are converted from annual (r_a) to quarterly (r_q) using the formula: $r_q = (1 + r_a)^{\frac{1}{4}} - 1$.

[148] As described above, Value Line's growth rate forecast horizon extends backward several years, so it is not comparable to the other growth estimates which are more recent.

members' historical EPS growth rates is an upwardly biased estimate of expected sector-average future growth.

Figure 19 shows real utility-sector dividend, price, and book value per share from 1927 through 2020. While there have been periods of growth and decline, the long-term trend for both has been in-line with inflation for over 90 years. For comparison, for the market as a whole, real per-share dividend and book value have both increased by over 5.5 times, and price by 18 times, over the same period. Based on this long-term history, the terminal growth rate in the UPG MS DCF is assumed to be equal to inflation.

Figure 19. Utility sector real dividend and book value per share, 1927-2020[149]
1927=1.0



To some, this growth rate may seem low. In context, though, it is not surprising. For the market as a whole, long-term real DPS growth has tracked GDP per capita, about 1.8% per year.[150] At any given time, some sectors grow faster, some slower. The technology and

[149] M. Ellis analysis of French Data Library and BLS data.
[150] See, for example, Ibbotson, Harrington, *Stocks, Bonds, Bills, and Inflation 2021 Summary Edition* (2021), pp. 157-160. Analysis is for total payout, to account for the effect of net stock repurchases.

healthcare industries, for example, have sustained DPS growth rates higher than the market average for decades. Utilities are a mature industry, and end-use demand for electricity, gas, and water has grown more slowly than GDP for decades, so it is not unreasonable for utility companies' per-share dividend growth to lag the market as whole.

Q. How do you estimate expected inflation?

For expected long-term inflation, I use Treasury-TIPS spreads. TIPS are Treasury Inflation-Protected Securities, which provide investors a return equivalent to inflation plus the quoted TIPS yield. The difference in yield between Treasurys and TIPS of equal maturity is a current measure of the market's forward-looking inflation expectation over the life of the bonds. As with interest rates, market-based inflation forecasts are generally considered superior to "expert" forecasts, for the reasons described there.

The UPG MS DCF uses inflation for the terminal, not initial or transition, growth rate, so we want to estimate expected inflation into perpetuity at the end of the transition phase, not from today. I use the expected inflation, i_{lt}, rate over the period from 20 to 30 years from now, as implied by the difference in the 30-year and 20-year Treasury-TIPS spreads:

$$i_{lt} = \left(\frac{(1+i_{30})^{30}}{(1+i_{20})^{20}}\right)^{\frac{1}{10}} - 1$$

Using average Treasury yields for the month of December 2021, the long-term inflation estimate is 1.79%.[151]

[151] M. Ellis analysis of FRED data.

4. Leverage adjustment

Q. Do you make any adjustments to your MS DCF results?

A. The MS DCF yields a levered cost of equity. To account for differences in capital structure between the UPG and Aquarion, I unlever the MS DCF results to arrive at an unlevered cost of capital, assuming 100% equity financing.[152] The unlevered cost of equity, k_u, is typically expressed as an adjustment to beta in the CAPM:[153]

$$k_u = r_f + \beta_u(r_m - r_f)$$

where the unlevered beta, β_u, is expressed in terms of the levered equity beta, β_e:[154]

$$\beta_u = \frac{E}{D+E}\beta_e$$

For consistency and comparability, I apply the same methodology – unlevering relative to the risk-free rate, not the company's cost of debt – to the MS DCF model results:

$$k_u = r_f + \frac{E}{D+E}\beta_l(r_m - r_f)$$

$$k_e - r_f = \beta_l(r_m - r_f)$$

$$k_u = r_f + \frac{E}{D+E}(k_e - r_f)$$

$$k_u = \frac{D}{D+E}r_f + \frac{E}{D+E}k_e$$

where D and E refer to debt and equity, respectively. Best practice is to use market, not book, values for both debt and equity as market reflects investors' actual exposure; they buy and

[152] The unlevered cost of equity differs from the weighted average cost of capital ("WACC"). The unlevered cost of capital assumes 100% equity financing; the WACC assumes the company's current capital structure. While under the Modigliani and Miller theorem of capital structure independence, the cost of capital should be the same regardless of capital structure, the WACC typically overstates the unlevered cost of equity because the *expected* return on corporate debt is lower than the yield due to default risk.

[153] See, for example, Damodaran, *Damodaran on Valuation*, 2nd ed. (2006), p. 129.

[154] Unlevered beta is sometimes adjusted for taxes (the "Hamada" adjustment). As explained in *Valuation*, pp. 790-93, when the capital structure is constant over time, as it is with utilities, then the value of tax shields tracks the value of operating assets. Thus, the risk of tax shields will mirror the risk of operating assets and have the same discount rate, i.e., the unlevered cost of equity.

sell securities at market value, not book.[155] Market values for all the debt carried by these companies is not readily available, though, so book value is assumed. Table 11 summarizes the UPG members' capital structures.

Table 11. Utility Proxy Group capital structure[156]
$ million, December 2021

		Equity			Market equity
Water utility company	**Debt**	Preferred	Common	Market	**ratio (%)[157]**
American States Water	614	0	679	3,679	86
American Water Works	11,174	0	6,866	32,683	75
California Water	1,185	0	1,116	3,618	75
Essential Utilities	5,780	0	5,128	12,929	69
Middlesex Water	329	2	362	1,879	85
SJW Group	1,568	0	1,001	2,092	57
York Water	134	0	151	632	82
Mean					**75**

Q. What do you assume for the risk-free rate?

A. Like Mr. D'Ascendis, I use the 30-year Treasury for the risk-free rate, although I use a current rate, in this case, the average over the month of December 2021, 1.85%.

5. Results

Q. What are your MS DCF unlevered COE results?

A. Table 12 summarizes the MS DCF results. The average unlevered COE is 3.49%. Note that, in contrast to Mr. Ascendis's CG DCF results, which have a mean of 9.19% and standard

[155] See, for example, *Valuation*, p. 309: "To determine the company's current capital structure, measure the *market value* of all claims against enterprise value." [emphasis added].
[156] M. Ellis analysis of S&P Global Market Intelligence data. Book values as of 2021Q3; market equity based on December 2021 average.
[157] For this analysis, preferred equity is treated as debt. Only Middlesex Water has a small amount of preferred equity, less than 0.1% of its total capitalization.

deviation of 2.54% (0.27x), the dispersion of my unlevered COE results is much narrower – 3.49% mean and 0.32% standard deviation (0.09x) – reflecting our models' respective accuracy and robustness.

Table 12. Utility Proxy Group MS DCF unlevered COE
As of December 2021

			Yield	Initial growth rate (%)					E/C	COE (%)	
Water utility company	**Price**	**DPS**	(%)	GMI	Yahoo!	Zacks	VL	Average	(%)	Levered	Unlevered
American States Water	99.60	1.46	1.47	6.00	6.70	NA	9.33	7.34	86	4.00	3.69
American Water Works	180.04	2.41	1.34	7.72	8.20	8.08	7.08	7.77	75	3.87	3.35
California Water	68.78	0.92	1.34	11.40	11.70	NA	5.74	9.61	75	4.13	3.57
Essential Utilities	51.15	1.07	2.10	6.16	6.40	6.22	7.77	6.64	69	4.77	3.87
Middlesex Water	107.37	1.16	1.08	NA	2.70	NA	5.07	3.89	85	3.08	2.89
SJW Group	70.15	1.36	1.94	8.00	5.70	NA	6.05	6.58	57	4.55	3.39
York Water	48.25	0.78	1.62	NA	4.90	NA	7.20	6.05	82	4.02	3.64
Mean										**4.06**	**3.49**
Standard deviation										0.54	0.32

Q. Do you use the MS DCF elsewhere in your analysis?

A. Yes. I use it as one of two methods to estimate the market risk premium for the CAPM.

C. CAPM

Q. Please explain your implementation of the CAPM.

A. There are three components to the CAPM: the risk-free rate, the market risk premium, and beta. As explained above, I use the current, not forecast, T30 for the risk-free rate. My market risk-premium is the average of the long-term historical average and a forward-looking estimate based on the MS DCF. Also as explained above, beta is the most subjective of the three CAPM parameters. Based on my review of the latest research literature, I estimate beta using five years of trailing monthly returns in excess of the T30.

1. Market risk premium

Q. How do you estimate the market risk premium?

A. I use the average of two methods, one historical, the other forward-looking.

Q. How do you estimate the historical MRP?

A. I use the long-term historical difference in the geometric average real total returns on the market and long-term Treasury bond. As explained previously, the geometric average better reflects investors' long-term expectations for equity returns, and bond returns should include capital gains, not just yield, which is only achievable if the bond is held to maturity.[158]

Figure 20 shows the long-term historical real returns on the market and 20-year Treasury bond, as well as the implied MRP, from June 1926 through December 2021. Over the last 95+ years, stocks have outperformed the T20 by 4.84% per year. Many analysts and investors believe the long-term historical average is not representative of future expectations.[159] Most of stocks' historical average premium over long-term bonds occurred before 1982. This can be seen clearly in the two trend lines in Figure 20. Returns on the T20 basically tracked inflation through mid-1981, while stocks outperformed the T20 by an average of 6.29% per year. Since then, stocks have outperformed the T20 by only 2.74%. This has been referred to as the "term premium puzzle."[160] While the specific reasons why the realized market risk premium has compressed so dramatically over the last forty years are

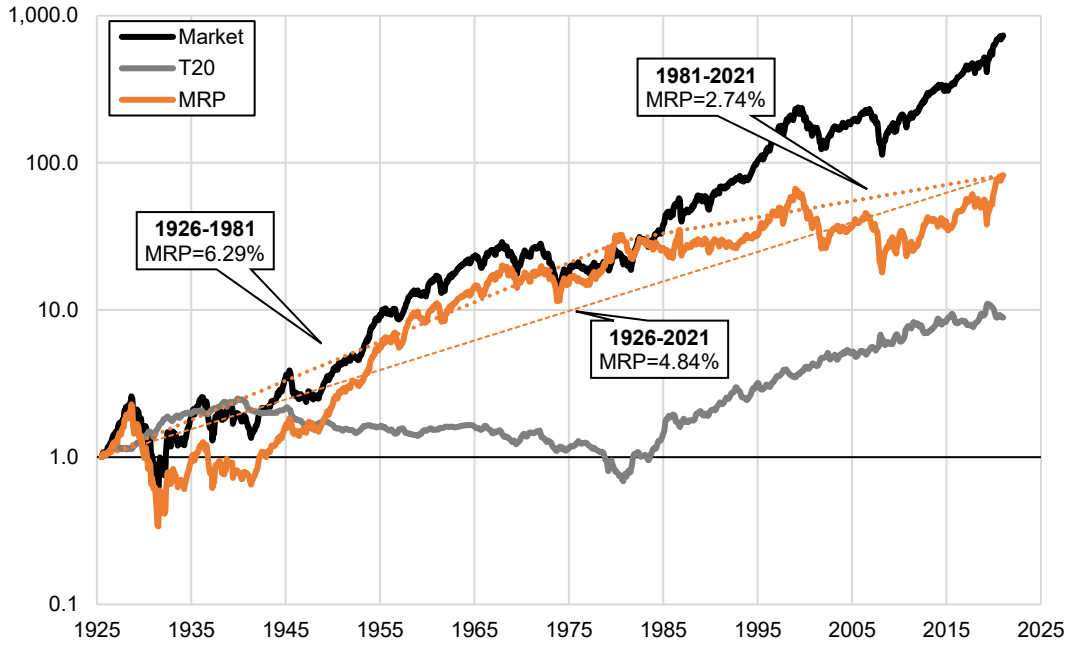
[158] Total bond return is the monthly interest (the yield divided by 12) plus any capital gain or loss, estimated as the change in value from discounting the remaining interest payments (i.e., the previous time period's interest rate) and outstanding principal at the current time period's interest rate. This method is widely used, for example, by NYU finance professor Aswath Damodaran (e.g., http://people.stern.nyu.edu/adamodar/pc/datasets/histretSP.xls) and UCLA finance professor Ivo Welch (e.g., https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1077876).

[159] See, for example, Dimson, Marsh, Staunton, *Triumph of the Optimists: 101 Years of Global Investment Returns* (2002), p. 9.

[160] Welch, *Corporate Finance*, p. 198.

the subject of debate, there is no disputing that it has done so. For this reason, I use a historical market risk premium equal to the average of the MRPs – the difference in geometric average market and T20 returns – over the entire time series, 4.84%, and over the last 40 years, 2.74%, or 3.79%.

Figure 20. Market, 20-year Treasury, and MRP real total return index[161]
June 1926=1.0 (log scale)



The historical MRP is calculated using the 20-year Treasury because that is the most extensive Treasury bond data set available.[162] Since we are using the T30 in our analysis, though, the premium is reduced by the current difference in the real 20- and 30-year Treasurys (TIPS), 0.19%, for a 30-year real MRP of 3.68%.

Q. How do you estimate the forward-looking MRP?

[161] M. Ellis analysis of French Data Library data. Available at: https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html.

[162] The early historical monthly data available for long-term Treasurys is not specifically for the 20-year. A simple regression model is used to adjust the long-term Treasury data to reflect an estimated 20-year yield.

A. I apply the same multi-stage DCF model I use for the UPG to the market as a whole, represented by the S&P 500 Index, and subtract the current 30-year Treasury.

Q. How do you estimate the current dividend yield for the S&P 500 Index?

A. I use the same methodology I use for the UPG members: the dividend paid in the last three months, through December 2021, divided by the average price of the index over the most recent month. I use the composite data reported by S&P. The current annualized yield is 1.35%.[163]

Q. How do you estimate the initial growth rate for the S&P 500 Index?

A. For each company in the S&P 500, I multiply the most recent dividend by the number of float-adjusted shares outstanding.[164] The sum is the total current dividend payment for the index members. I then project each company's total dividend out three years at its average analysts' estimated EPS growth rate and sum the total. Only companies for which there are analyst estimates are used. The CAGR between the current and future total S&P 500 dividend is the market-weighted average dividend growth rate, currently 14.06%.

[163] All S&P 500 Index data is from S&P Global Market Intelligence, as of December 30, 2021.

[164] Float-adjusted market capitalization counts only shares available for purchase on open markets, excluding shares that are not available due to regulation, cross-shareholding, and strategic holdings (e.g., by insiders or family). Most major stock indexes now use float-adjusted market capitalization. The S&P 500's current market capitalization-weighted float is 94%. See: https://www.marketwatch.com/story/sp-move-to-float-adjusted-indexes-will-create-turnover.

Q. How do you treat non-dividend-paying stocks?

A. Non-dividend paying stock are included in the current yield calculations, because they are included in the index return data reported by S&P. The dividend growth rate calculation is based on the sum of total dividends paid, so it includes only dividend-paying stocks.

Q. How do you estimate the terminal growth rate for the S&P 500 Index?

A. Many analysts assume long-term dividend growth equal to nominal GDP growth. This is incorrect. Historically, per-share payout growth, whether measured as dividends or dividends plus net share buybacks, has tracked GDP per capita.[165] I assume a terminal growth rate based on forecast real long-term per-capita GDP plus the current market forecast for long-term inflation.

For long-term per-capita GDP growth, I use the average of the most recent long-term CPI-adjusted forecasts from three government agencies: the Congressional Budget Office (CBO),[166] the Energy Information Administration (EIA),[167] and the Social Security Administration (SSA).[168] I use the compound annual growth rate from 2041 to remove any near-term transitory effects, such as post-covid economic recovery, and to align with the time period used to estimate long-term inflation (years 21 through 30 from today).

TIPS payouts are tied to CPI, so the Treasury-TIPS spread is a forecast of consumer price inflation. In contrast, real GDP forecasts are deflated by the GDP deflator, which reflects the

[165] See, for example, Ibbotson, Harrington, *Stocks, Bonds, Bills, and Inflation 2021 Summary Edition* (2021), pp. 157-160. Analysis is for total payout, to account for the effect of net stock repurchases.
[166] Congressional Budget Office, "The 2021 Long-Term Budget Outlook" (March 2021); data available at: https://www.cbo.gov/system/files/2021-03/57054-2021-03-Long-Term-Economic-Projections.xlsx.
[167] Energy Information Administration, "Annual Energy Outlook 2021" (February 2021); data available at: https://www.eia.gov/outlooks/aeo/excel/aeotab_20.xlsx.
[168] Social Security Administration, "The 2021 Annual Report of the Board of Trustees of the Federal Old-Age and Survivors Insurance and Federal Disability Insurance Trust Funds" (August 2021); data available at: https://www.ssa.gov/oact/TR/2021/SingleYearTRTables_TR2021.xlsx.

prices of all domestic expenditures, including by businesses and government. For consistency with the CPI forecast derived from the Treasury-TIPS spread, I use each agency's nominal GDP forecast deflated by its CPI forecast, rather than its GDP deflator forecast. Table 13 summarizes the three agencies' real long-term per-capita GDP forecasts.

Table 13. Real long-term per-capita GDP forecasts
Percent

		GDP				Nominal		CPI-deflated
Forecast	**Horizon**	Real	Deflator	Nominal	Population	**GDP pc**	CPI	**GDP pc**
CBO	2051	1.52%	1.95%	3.50%	0.27%	3.22%	2.23%	0.97%
EIA	2050	1.93%	2.57%	4.56%	0.40%	4.14%	2.48%	1.62%
SSA[169]	2100	NA	NA	4.09%	0.42%	3.65%	2.40%	1.22%
Mean		1.73%	2.26%	4.05%	0.37%	3.67%	2.37%	**1.27%**
+ Treasury-TIPS long-term inflation						3.08%	1.79%	

The average of the agencies CPI-deflated long-term per-capita GDP growth rates is 1.27%. Adding the same long-term inflation expectation used in the UPG terminal growth rate, 1.79%, gives a nominal rate of 3.08%.[170] The agencies' corresponding rates average 3.67%. I use the market-implied long-term inflation rate rather than the agencies' for two reasons. First, although all three forecasts are the agencies' most recent, they are stale in comparison to the December 2021 average Treasury rates used to estimate inflation. Second, as demonstrated by the analysis of BCFF forecasts, market-derived data are generally considered less biased and more accurate indicators of investor expectations than expert forecasts.

[169] SSA does not forecast real GDP or the GDP deflator, only nominal GDP and CPI.
[170] Because these are compound growth rates, the geometric sum is used, $(1 + g)(1 + i) - 1$.

Q. What is your forward-looking MRP?

A. The S&P 500 MS DCF yields a forecast return of 5.97%. Subtracting the current T30, 1.85%, gives an MRP of 4.12%, 0.44% higher than my historical MRP of 3.68%.

Q. And your combined MRP?

A. The average of my historical and forward-looking MRPs is 3.90%.

2. Beta

Q. How do you estimate beta?

A. As explained above, there is no single, widely used approach to estimating beta. Beta estimates can vary substantially depending, in particular, on the historical trailing period used, return calculation frequency, and adjustment for long-term trend reversion. I do not use betas from providers like Value Line, Bloomberg, or Yahoo! Finance because their betas are calculated using absolute returns and are therefore not appropriate for the zero-beta version of the CAPM we are using, where the security market line is defined relative to the T30.

Based on my review of the research literature, my own analysis of utility betas, and the context of this specific analysis – in which stock price information for the target utility itself is not available, and a peer group average is used instead – I believe the most appropriate methodology for estimating water utility betas for regulatory cost of capital purposes is to use five years of trailing simple monthly returns in excess of the T30 return, adjusted 60/40 toward the long-term sector average. The rationale for each element is explained below.

- *Five-year trailing history*: Longer trailing histories reduce the impact of short-term events like the market turmoil of early 2020 and better reflect long-term trends. Five

years of trailing monthly returns is used in much of the academic literature on the CAPM (e.g., Blume, FF, BJS) and is also used by Yahoo! Finance.

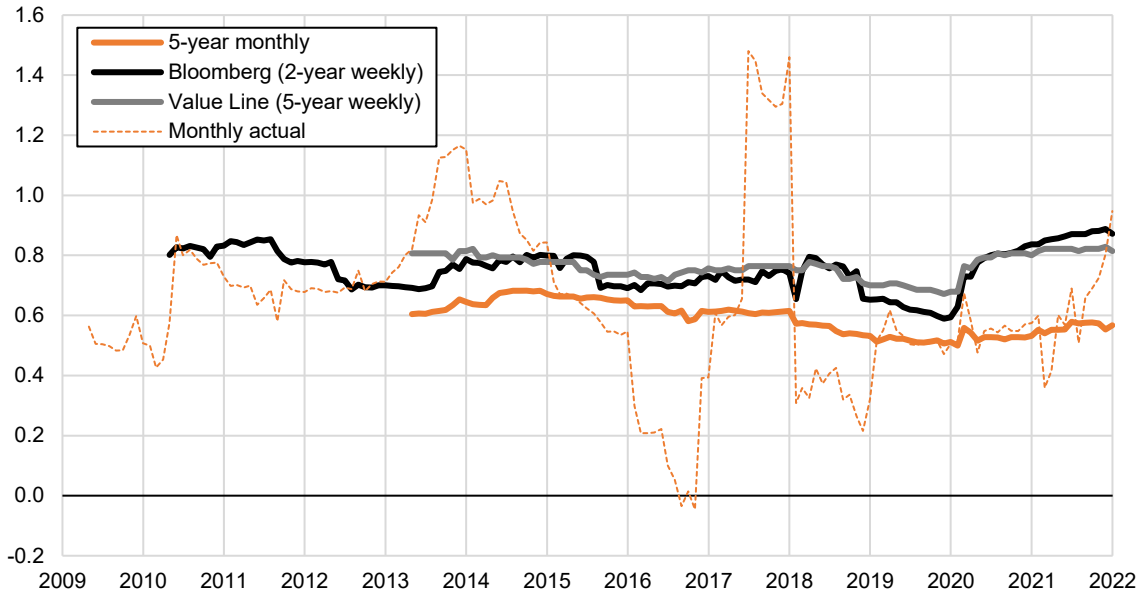
- *Monthly return frequency*: Monthly returns are less volatile and tend to better reflect a longer-term risk profile. We are interested in capturing the long-term risk profile of utilities, not exposure to short-term market fluctuations.
- *Excess returns*: Data service providers' betas are generally not calculated using excess returns, because subtracting the short-term risk-free rate has negligible impact on the calculated beta. As the FF and BJS study replications demonstrated, though, the choice of risk-free rate materially changes the slope of the security market line. Betas using returns in excess of the long-term Treasury, therefore, more accurately reflect the relationship modeled by the CAPM as used in utility cost of capital proceedings. In general, betas thus calculated tend to be higher for low-beta stocks like utilities and lower for high-beta stocks.
- *Adjustment toward long-term trend*: While the rationale for the Blume adjustment is generally sound – overall, betas do trend toward the market average – it does not apply to utilities. Rather, utilities tend to trend toward a long-term average of 0.55-0.60. UCLA finance professor Ivo Welch, who has perhaps published more research investigating beta than anybody else, suggests, for long-term investments, a 60/40 weighting of current and long-term average betas.[171]

Figure 21 compares the evolution over time of the UPG average beta calculated: (1) using five years of trailing monthly excess returns and adjusted 60/40 toward the long-term average

[171] Welch, *Corporate Finance*, 4th ed. (2017), pp. 222.

(0.56);[172] (2) comparably to the adjusted Bloomberg and Value Line 2- and 5-year trailing weekly return betas used by Mr. D'Ascendis;[173] and (3) using one year of trailing monthly excess returns, i.e., actual beta.

Figure 21. UPG average beta – 5-year trailing monthly, Bloomberg and Value Line analogs, and actual



As seen in the chart, several characteristics recommend the 5-year trailing adjusted monthly beta. It is less volatile. While the long-term risks of stocks can evolve over time, they should not change appreciably day-to-day or month-to-month, especially for utilities. It also more closely tracks actual beta over time. In contrast, the Bloomberg and Value Line betas are systematically too high and less stable. Both are also inordinately sensitive to the

[172] Because the UPG data series extends back to only April 2008, the utility-sector average, 0.57, is used, plus an adjustment, -0.01, for the difference in average monthly beta between the UPG and utility sector since April 2008.

[173] The analogs are not exactly the same; Bloomberg and Value Line use price-only, not total, returns, and Value Line uses the NYSE Composite, not the S&P 500, for its market proxy. These differences do not materially change the results.

market volatility of early 2020, continuing to increase despite calmer market conditions that have led to a 74% average increase in the UPG members' stock prices since then.[174]

3. Results

Q. What is the result of your CAPM analysis?

A. Table 14 summarizes my CAPM results. The average levered and unlevered betas are 0.57 and 0.43, respectively. The unlevered COE is 3.52%, very close to the MS DCF result of 3.49%.

Table 14. Utility Proxy Group CAPM results[175]
As of December 2021

	Levered		Market equity	Unlevered	
Water utility company	Beta	COE (%)	**ratio** (%)	Beta	COE (%)
American States Water	0.45	3.62	86	0.39	3.37
American Water Works	0.51	3.84	75	0.38	3.33
California Water	0.51	3.84	75	0.39	3.35
Essential Utilities	0.61	4.24	69	0.42	3.50
Middlesex Water	0.64	4.35	85	0.55	3.98
SJW Group	0.62	4.27	57	0.35	3.23
York Water	0.62	4.27	82	0.51	3.85
Mean	**0.57**	**4.06**	76	**0.43**	**3.52**
Standard deviation	0.07	0.29		0.07	0.28

As with the DCF, the results vary considerably less across companies than Mr. D'Ascendis's corresponding analysis, with an unlevered COE standard deviation-to-mean ratio 0.08x (0.28%/3.52%), compared to Mr. D'Ascendis's 0.12x.

[174] From their respective lows in March 2020 through December 31, 2021.
[175] M. Ellis analysis of S&P Global Market Intelligence data. Market equity based on December 2021 average.

D. UNLEVERED COE RESULTS

Q. And the average of your MS DCF and CAPM results?

A. The average of the MS DCF and CAPM unlevered COEs, 3.49% and 3.52%, respectively, is 3.50%. This result will need to be relevered at Aquarion's target capital structure.

The unlevered cost of equity estimates are likely conservative – overstating the actual cost – because the market value of debt is almost certainly higher than the book value assumed, due to the nearly continuous decline in interest rates over the last several decades. For example, Aquarion's weighted average long-term interest rate is currently 5.90%[176] At its current customer rates and capital structure, its credit rating would be between A2 and A3, and its cost of debt approximately 3.15%. The present value of remaining coupon payments discounted at the current rate is roughly 17% higher than book value. A lower equity ratio would reduce the weight of the levered cost of equity and, therefore, the calculated unlevered cost of equity. An 18% premium over book value would reduce the average unlevered COE to 3.43%.

E. COE BENCHMARKING

1. Investment firms

Q. The results of your COE analyses, even on a levered basis, seem high relative to typical authorized ROEs. Are there any independent analyses that support your estimates?

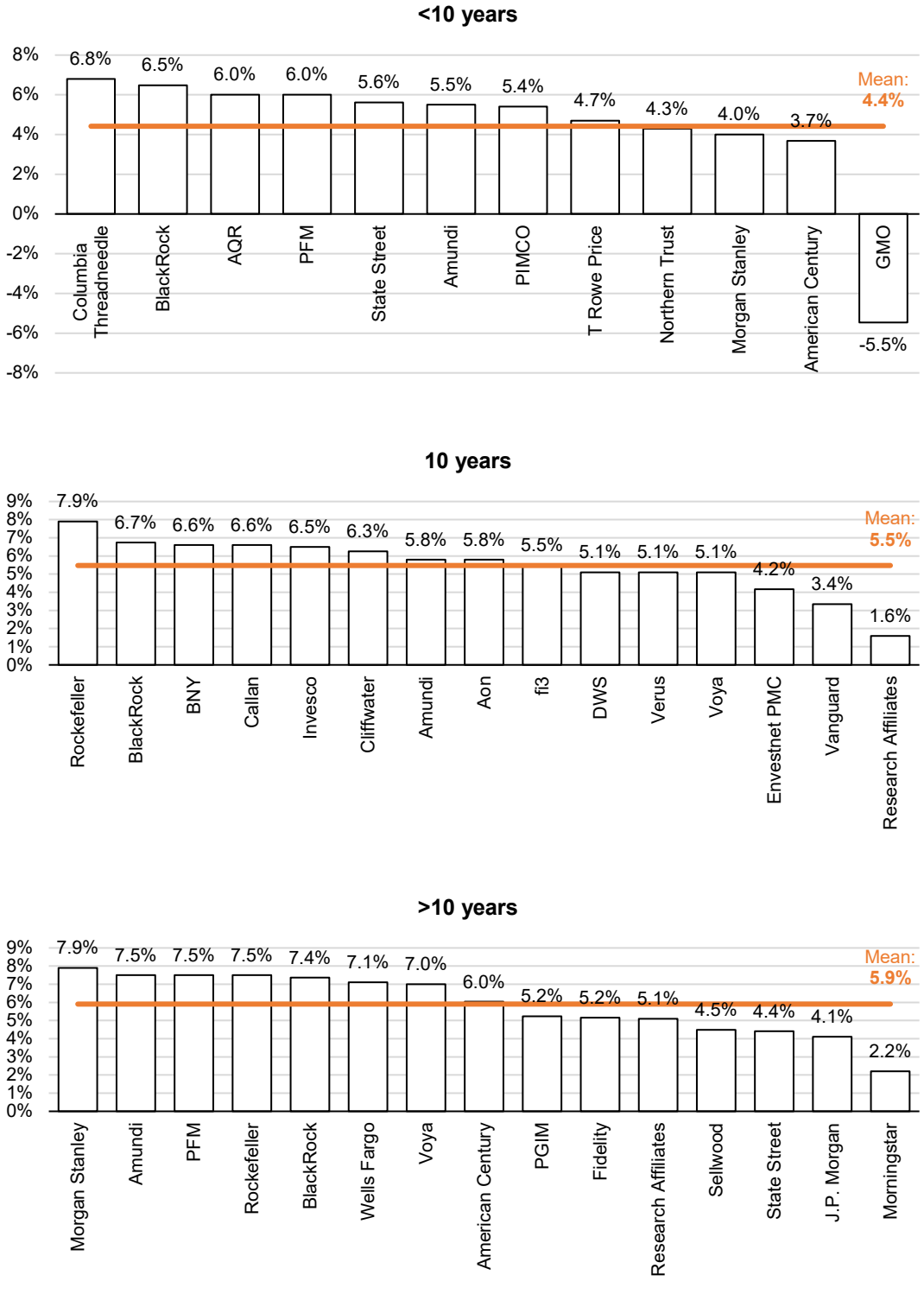
A. Utility regulatory proceedings are not the only venue in which expected returns are estimated. Investment firms, such as JP Morgan, BlackRock, and T. Rowe Price, regularly publish their capital market assumptions (CMAs), which are return forecasts for various

[176] The coupon rate investors receive, not the 6.14% cost rate grossed-up for issuance costs. Schedule No. 4D.

assets classes. Figure 22 summarizes the most recent (nominal, geometric) US equity market return forecasts from over thirty firms, grouped by assumed investment horizon: less than ten years, ten years (the most common), and more than ten years.[177] The average across the longer-term 10-year and more-than-10-year horizons, 5.7%, is nearly equal to the 5.8% average implied MS DCF and CAPM total market returns. Not a single one of the forty-seven forecasts reviewed[178] is within 4.2% of the six market return measures used in Mr. D'Ascendis's market risk premium calculations, the lowest of which is 12.10%.[179]

[177] Thirty-four CMA reports were reviewed in the fourth quarter of 2021, of which two were excluded for insufficient data on investment horizon, return type (geometric or arithmetic). Forecasts are for the entire US equity market where available; otherwise for large-capitalization stocks only, which account for ~90% of the market.
[178] Some CMAs included forecasts for multiple time horizons.
[179] Ibbotson arithmetic mean MRP. Attachment DWD-5, p. 2.

Figure 22. US equity market expected returns[180]
Nominal, geometric



[180] Investment firm CMA reports. Forecasts are for US large-capitalization equities or total market.

Q. But aren't analyst forecasts biased?

A. The analysts providing the individual stock forecasts that go into the consensus estimates reported by Bloomberg, Zacks and Yahoo! Finance, and others all come from the "sell side" of the securities industry. The sell side engages in the creation, promotion, and selling of securities offerings. Their clients are not the institutional or public investors that ultimately buy the securities, but the companies, like utilities, seeking to raise money. They are in the business of transactions, not picking the best investments. Hence the ever-present suspicion of optimism bias in their forecasts: they are trying to curry favor with their existing and potential clients and to present the securities they market in the most favorable light.

CMAs come from the "buy side" – the institutional investors and asset managers that buy securities on behalf of others. They are in the business of trying the find best investments. Until a few years ago, few firms publicly distributed their CMA reports, so there is not sufficient data to determine whether they suffer from bias to the same extent as sell-side EPS estimates. But given their objectives, they would appear to be incentivized to produce unbiased and accurate forecasts: pessimism risks losing clients, while optimism risks disappointing them.

2. Market-to-book ratio

Q. Is there other evidence that authorized ROEs are too high?

A. It has long been recognized that the market-to-book ratio provides insight into the relationship between authorized return and the true cost of capital. Legendary regulatory

economist Alfred Kahn[181] called attention to this phenomenon over fifty years ago in his 1970 classic *The Economics of Regulation: Principles and Institutions*:[182]

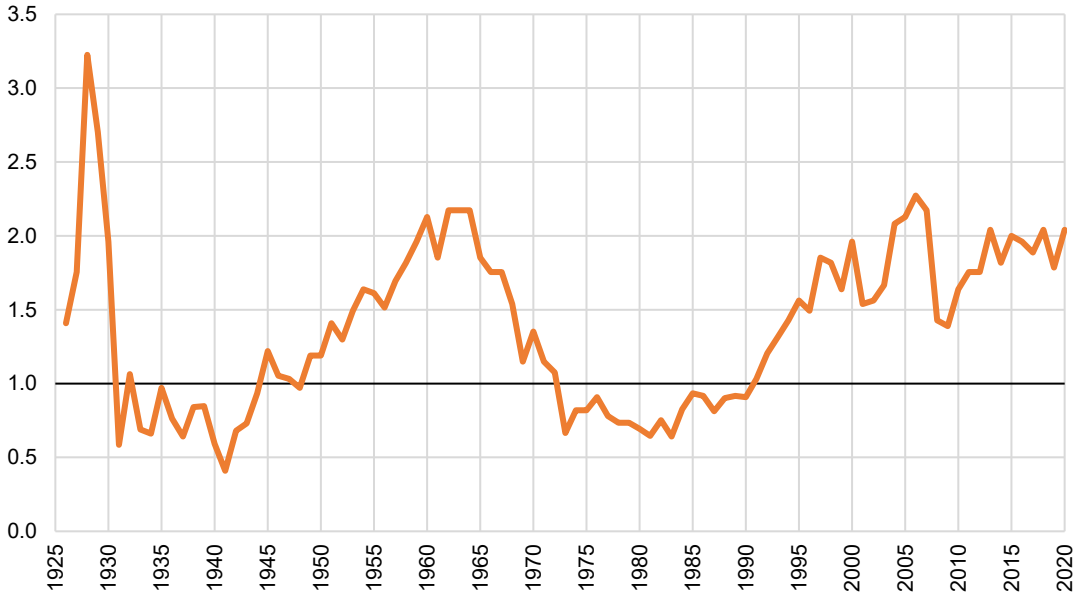
> [T]he sharp appreciation in the prices of public utility stocks, to one and half and then two times their book value during this period, reflected … a growing recognition that the companies in question were in fact being permitted to earn considerably more than their cost of capital. … The source of the discrepancy between market and book value has been that commissions have been allowing *r*'s [returns on equity] in excess of *k* [market cost of equity]; if instead they had set *r* equal to *k*, or proceeded at some point to do so … the discrepancy between market and book value … would have disappeared, or would never have arisen.

Kahn was referring to the period of the late 1940s to 1965, but the observation that utilities trade above book value is equally valid today. As seen in Figure 23, the utility sector average M/B ratio has exceeded 1.0 for nearly thirty years and, except for a short period after the global financial crisis, has exceeded 1.5 since 1995. The current average M/B ratio of the members Utility Proxy Group is even higher, at 3.9.[183]

Of course, valuation differences will arise due to parent company leverage and business mix, particularly the move into non-utility lines of business in the late '90s. For the sector as a whole, though, the vast majority of its valuation comes from traditional utilities. That the sector has traded at 1.5 to 2.0 times book value for decades is a clear indication that authorized ROEs have exceeded the cost of equity.

[181] See, for example, https://en.wikipedia.org/wiki/Alfred_E._Kahn.
[182] Kahn, *The Economics of Regulation: Principles and Institutions* (1970), p. 48, note 60, p. 50.
[183] S&P Global Market Intelligence, as of December 31, 2021.

Figure 23. Utility sector average market-to-book ratio[184]
Year-end



In another commonly referenced source, Kolbe, Read, and Hall's *The Cost of Capital: Estimating the Rate of Return for Public Utilities*, the authors recommend using a M/B ratio of 1.0 as a "guide for regulators" in setting the cost of capital:[185]

> The market-to-book ratio expresses the market value of the firm's outstanding common stock to the book value of its equity. If the two are equal the expected return on the book will equal the expected return on the market value of the company, which in turn will equal the cost of capital for a company of that degree of risk.

Kahn and Kolbe, et al, draw their conclusion from a basic financial concept: a positive net present value (NPV), i.e., value net of investment, is the signature indicator of a return above the cost of capital.[186] That utilities trade at a premium to book value (i.e., invested capital), is

[184] Year-end. M. Ellis analysis of FDL data.
[185] Kolbe, Read, Hall, *The Cost of Capital: Estimating the Rate of Return for Public Utilities* (1984), p. 25.
[186] Curiously, Kolbe and another set of co-authors walk back this argument in a later book, arguing that market inefficiency could account for persistently high utility market-to-book values and citing the Nobel Prize lecture of Robert Shiller, awarded for his work on market inefficiencies:

> Professor Shiller holds instead that market prices are materially affected by human traits that are not always in accord with pure economic rationality. Among other things, *Professor Shiller has shown that the standard present value formula does not explain stock prices, which are too volatile for that model to hold true.* If stock prices are

prima facie evidence that they are earning more than their cost of capital.[187] In practical terms, this means that, for every dollar of equity the UPG members invest, shareholders receive back not just their investment plus a reasonable return (which would be the case when M/B = 1.0), but additional value equivalent to nearly three times their investment (3.9 – 1.0 = 2.9). Such high returns are not necessary to attract capital and needlessly increase rates.

3. Authorized ROE-Treasury spread

Q. Why do you think regulators have continued to approve authorized ROEs in excess of utilities' actual cost of equity?

A. I do not have any insight into regulators' thought processes or motivations, but mathematicians have developed a model to explain such behavior, known as the Pólya urn.[188] We can think of historical cost of capital decisions as balls in an urn. To decide on a new case, the regulator draws a ball from the urn. The ball is then replaced, along with a new ball with the same value. This process of sampling with replacement plus duplication has a self-reinforcing property sometimes called the rich-get-richer or Matthew effect.

> nonetheless rationally priced, it is in accord with a formula that we do not yet know. [Villadsen, Vilbert, Harris, *Kolbe, Risk and Return for Regulated Industries* (2017), p. 295; emphasis added.]

Yet in that very same speech Shiller points out:

> These conclusions about the aggregate stock market, however, do not carry over fully to individual stocks. … In individual firms there is sometimes a lot of action in the ratios, and the action in fact often reflects real knowledge about future cash flows. That is an example of the kind of idiosyncratic knowledge about individual firms that makes the efficient markets model a useful approximation of reality for individual firms. [Shiller, "Speculative Asset Prices" (2013), p. 478; available at: https://www.nobelprize.org/uploads/2018/06/shiller-lecture.pdf.]

Shiller also cites another Nobel laureate economist, Paul Samuelson:

> The market is] micro efficient but macro inefficient. That is, individual stock price variations are dominated by actual new information about subsequent dividends, but aggregate stock market variations are dominated by bubbles. [p. 476.]

The market-to-book ratio is a valid and robust indicator of the market's perceived value of utilities.

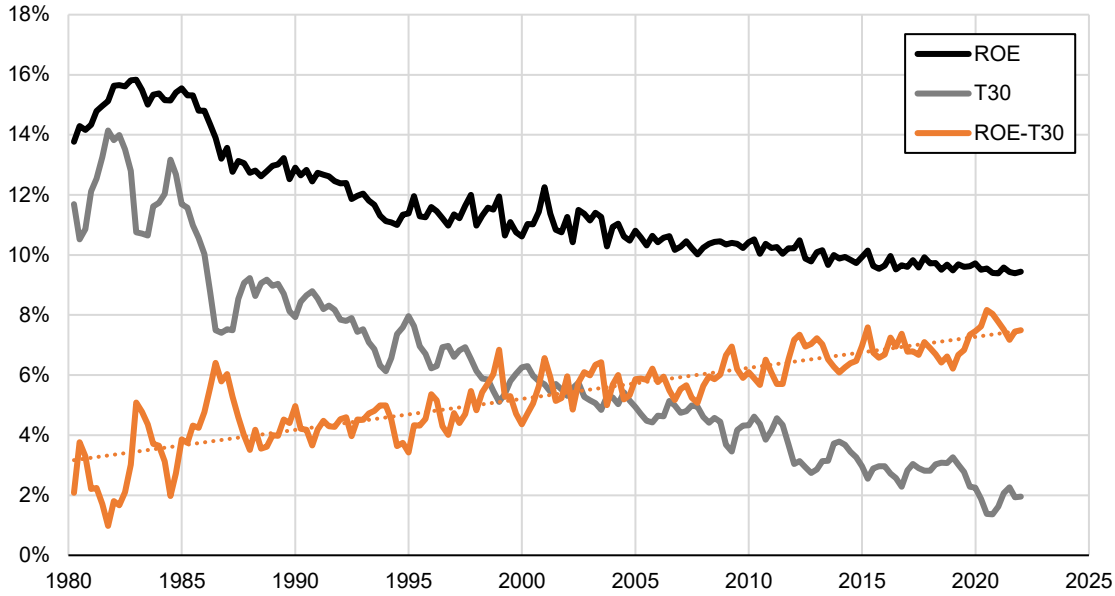
[187] Rate base can differ slightly from book value, typically due mostly to the deduction of deferred income taxes, an interest-free loan from the government, from rate base. The argument is equally valid if rate base is substituted for book value.

[188] https://en.wikipedia.org/wiki/P%C3%B3lya_urn_model.

Of course, this model is over-simplified. Regulators look at other information besides past authorized ROEs. The basic model can be modified to include additional balls in the urn representing new information, such as the estimated current cost of equity. Nonetheless, as long as regulators look at past ROEs, the authorized ROE will lag the true cost of equity. In a market in which interest rates and, assuming a relatively stable equity risk premium, the cost of equity have been trending downward for decades, authorized ROEs will consistently exceed the actual cost of equity, and the spread will widen over time.

This is exactly what we see in the data. Figure 24 shows the quarterly average authorized ROE, 30-year Treasury rate, and their difference. Both Treasury rates and ROEs have been declining steadily since the mid-1980s, but ROEs have declined much more slowly, such that the ROE-Treasury spread has more than doubled, from approximately 3.8% in the 1980s to 7.7% over the last two years. It can be estimated that, even under very conservative assumptions, regulators, on average, assign no more than a 25% weight to the current cost of equity and at least 75% to recent ROEs.

Figure 24. Quarterly average authorized ROE and 30-year Treasury rate[189]



Earlier, in my discussion of Mr. D'Ascendis's Non-Price Regulated Companies proxy group, I drew an analogy between estimating the cost of equity and developing a calorie intake recommendation. That analogy is apt here, as well. Looking at *actual* authorized ROEs to estimate the *required* ROE is akin to developing a calorie intake recommendation based on how much people *actually* heat, not what they need to maintain a healthy weight.

Others have made similar observations about the growing divergence between authorized ROEs and utilities' actual COEs. In a study published in 2019 exploring potential explanations, Carnegie Mellon researchers David Rode and Paul Fischbeck concluded:[190]

> It would appear that regulators are authorizing excessive returns on equity to utility investors and that these excess returns translate into tangible profits for utility firms. … In the end, we may observe simply that what regulators *should* do, what regulators *say* they're doing, and what regulators *actually* do may be three very different things [emphasis in original].

[189] M. Ellis analysis of S&P Global Market Intelligence and FRED data.
[190] Rode, Fishchbeck, "Regulated equity returns: A puzzle," *Energy Policy*, 133 (2019).

F. INTEGRATED ROE-CAPITAL STRUCTURE MODEL

1. Overview

Q. How do you determine Aquarion's capital structure?

A. As discussed previously, the capital structure should be based on a target credit rating, but credit rating is a function of capital structure, ROE (via FFO), and cost of debt (via interest) so capital structure and ROE need to be determined jointly. The integrated capital structure-ROR model (ICSRM) simultaneously solves for the book equity ratio (e_b), levered cost of equity (k_e), and cost of debt (r_d) based on the relationships between credit rating, capital structure, cost of debt, and ROE, expressed as equations in Table 15, given the known inputs of Aquarion's unlevered COE (k_u), depreciation and amortization (DA), and deferred taxes (T_d), and the risk-free rate (r_f).

Table 15. ICSRM capital structure, cost of equity, and cost of debt equations

Equation	Terms	
$CR = f_M\left(\frac{D}{C}, \frac{FFO}{D}, \frac{FFO + Dr_d}{Dr_d}\right)$	CR $f_M()$ C D FFO r_d	: credit rating : Moody's rating methodology : total book capitalization (debt and equity) : debt : funds from operations : cost of debt
$D = C(1-e_b)$	e_b	: book equity ratio
$FFO = k_e e_b C + DA + T_d$	k_e DA T_d	: levered COE (MS DCF/CAPM average) : depreciation and amortization : deferred taxes
$k_e = \frac{k_u - r_f(1-e_b)}{e_b}$	k_u r_f	: unlevered COE (MS DCF/CAPM average) : risk-free rate
$r_d = f_d(CR)$	$f_d()$	: empirical relationship between utility bond credit rating and interest rate (binomial regression)

2. Short-term debt amount

Q. How do you determine the amount of short-term debt?

A. According to Aquarion's most recent annual report, its total short-term debt was $2,833,281 as of the end of 2020, including $33,281 of intercompany accounts payable – more than

twice the $1.2 million in its application. This increase in short-term debt may be in anticipation of the pending maturity of $8 million of long-term debt through June 2023 and will be replaced by long-term debt. I therefore assume that Aquarion's short-term debt will be kept at a fixed $1.2 million.

3. Market value adjustment

Q. Are the resulting relevered COE and capital structure your recommendations?

A. No. The cost of equity is a breakeven figure – the return that would make an investor indifferent between investing or not. Recognizing the need to attract investors, the ROE should be set to ensure a positive net present value, i.e., M/B ratio greater than 1.0. Although a market-to-book ratio of 3.7, the UPG's current average, is clearly excessive – there's no need to return to investors nearly four times the value of their investment in low-risk infrastructure – it should exceed 1.0.

The ICSRM adjusts the ROE and capital structure to achieve a valuation target, as reflected in the M/B ratio. An alternative approach might simply add a spread to the ROE, e.g., 1%. But the choice of any such spread without understanding its implications for shareholder value would be arbitrary. A target M/B ratio enables the regulator to accurately assess how much incremental *value* they are providing investors. Relatively small changes in ROE, on the order of 0.1%, create significant value for shareholders.

The model used to estimate the M/B ratio is based on the *sustainable-growth DCF* (SG DCF):

$$M = \frac{Br(1-b)}{k_e - br}$$

where M is the market value of equity (the value to shareholders), M is book equity value, r is the return on equity (ROE), k_e is the levered cost of equity, and b is the earnings retention ratio. A reformulation of the constant-growth DCF model described above, the SG DCF attributes growth to reinvestment of the fraction of earnings that are not distributed as dividends, i.e., br is equal to g, and $Br(1-b)$ to $D_0(1+g)$. This form of the DCF is called "sustainable-growth" because the growth rate is what can be sustained by internal cash flow generation without additional equity issuance. The retention ratio, b, will be determined by investment needs, i.e., growth, and ROE, so it must be solved for, as well. Rearranging terms, b drops out, and ROE can be expressed:

$$r = \frac{M}{B}(k_e - g) + g$$

Implementing the SG DCF therefore requires a long-term growth assumption.

4. Aquarion long-term growth rate

Q. How do you estimate Aquarion's long-term growth rate?

A. Aquarion's estimated long-term growth rate is based on a time-weighted, inflation-adjusted average of Aquarion's 2007-20 historical total capitalization growth rate (3.24% in real terms[191]) and the long-term sector average (0% real). Aquarion is assumed to continue growing at its historical rate for ten years, and then transition to the industry average over the next ten years. In each phase, the relevant market-based inflation rate, calculated from Treasury-TIPS spreads is added. The weighted average is 2.32%.[192]

[191] Per Aquarion's annual reports, 2007 and 2020 total capitalization were $19.4 million and $36.6 million, respectively, for a CAGR of 5.02%. Inflation over that period was 1.72%.

[192] This growth assumption is conservative; the lower the long-term growth rate, the higher the ROE needed to achieve any target M/B ratio.

5. ROE volatility adjustment

Q. Are any other factors considered in the ICSRM?

A. Yes. Earlier, I discussed the difference between arithmetic and geometric returns, why the historical geometric average is a better indicator of investor expectations for future equity returns, and the need for consistency between the type of returns produced by the DCF and CAPM. There is one additional consideration.

Expected return and cost of capital are frequently used interchangeably, as explained in *Valuation*:[193]

> The cost of capital is the price charged by investors for bearing the risk that the company's future cash flows may differ from what they anticipate when they make the investment. The cost of capital to a company equals the minimum return that investors expect to earn from investing in the company. That is why the terms *expected return* to investors and *cost of capital* are essentially the same. The cost of capital is also called the discount rate, because you discount future cash flows at this rate when calculating the present value of an investment, to reflect what you will have to pay investors [emphasis in original].

The ROE authorized in utility regulatory proceedings is not identical to the cost of capital, for two reasons. First, regulators may deliberately set the ROE higher than the cost of capital in order to attract investors and ensure the utility's financial integrity, per *Hope*. Second, the cost of capital is a compounded average, while ROE, even for the best managed utilities, will undoubtedly vary from year to year. The authorized ROE should therefore be expressed in terms of an expected arithmetic return. There is a mathematical relationship that allows us to convert the geometric average (k_g) return into an arithmetic (k_a) average:

$$k_a = k_g + \frac{\sigma^2}{2}$$

[193] Koller, et al, *Valuation*, 5th ed. (2010), p. 35.

where σ is the standard deviation of the expected return on the utility operating company's equity. Assuming the future standard deviation will be equal to Aquarion's historical realized ROE standard deviation from 2008 through 2020 – 4.50% – the geometric estimate should be increased by 0.10%.

Q. Why don't you use the standard deviation of shareholder returns in public equity markets?

A. It is not appropriate to use the standard deviation of shareholder returns in public equity markets, which is driven almost entirely by changes in price. Publicly traded utility stocks are subject to many factors outside the control of regulators and utilities, like changes in interest rates, inflation expectations, and investor risk appetite, that cause prices, and therefore the value of the underlying investment, to fluctuate. Even a "risk-free" government bond is subject to daily changes in its value as interest rates change. Such changes in underlying asset value, i.e., price, are the primary drivers of investment return volatility.[194]

For utilities, the underlying asset – rate base – is not subject to revaluation risk; only the income is, which significantly reduces the volatility of returns relative to publicly traded securities. In adjusting the geometric ROE, the relevant standard deviation is therefore that of realized ROEs, not shareholder returns. Essentially, the ROE should be determined in answer to the question, "What is the *arithmetic* return required to provide the operating utility company a *geometric* return equal to the market-based geometric cost of equity?"

[194] From June 1926 through December 2021, the utility sector average annualized standard deviation of both total and price-only returns was 19.0%.

Q. How do the ICSRM model equations change with the incorporation of valuation and return volatility considerations?

A. Incorporating the valuation model and ROE volatility, the ICSRM simultaneously solves the equations in Table 16.

Table 16. ICSRM capital structure, valuation, ROE, and cost of debt equations

Equation	Terms
$CR = f_M\left(\frac{D}{C}, \frac{FFO}{D}, \frac{FFO + Dr_d}{Dr_d}\right)$	CR : credit rating $f_M()$: Moody's rating methodology C : total book capitalization (debt and equity) D : debt FFO : funds from operations r_d : cost of debt
$D = C(1-e_b)$	e_b : book equity ratio
$FFO = k_e e_b C + DA + T_d$	k_e : levered COE (MS DCF/CAPM average) DA : depreciation and amortization T_d : deferred taxes
$r = \frac{M}{B}(k_e - g) + g$	$\frac{M}{B}$: target market-to-book ratio k_e : levered COE g : Aquarion's assumed long-term growth rate
$k_e = \frac{k_u - r_f(1-e_m)}{e_m} + \frac{\sigma_r^2}{2}$	k_u : unlevered COE (MS DCF/CAPM average) r_f : risk-free rate e_m : market equity ratio σ_r : standard deviation of Aquarion historical ROE
$e_m = \frac{\frac{M}{B}e_b}{\frac{M}{B}e_b + (1-e_b)}$	
$r_d = f_d(CR)$	$f_d()$: empirical relationship between utility bond credit rating and interest rate (binomial regression)

6. Results and recommendations

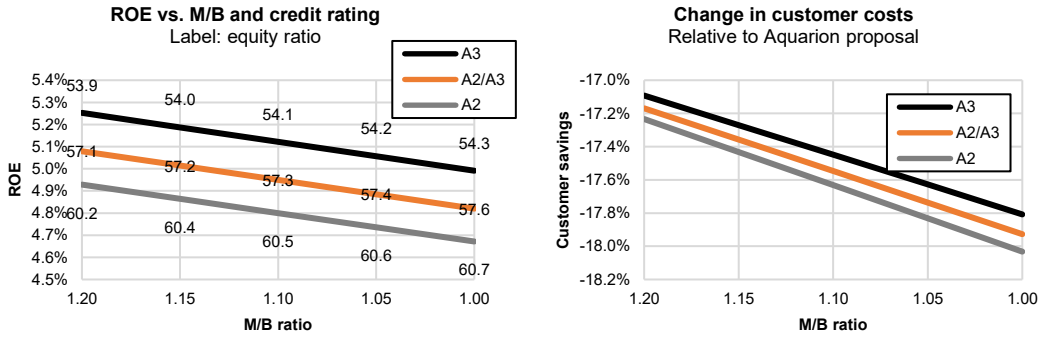
Q. What are the results of the ICSRM?

A. The model allows us to examine the capital structure and ROE under a range of credit rating and M/B targets. We can also supplement it with data from Aquarion's rate case to estimate the impact on customers relative to Aquarion's proposed $8.96 million revenue.[195]

[195] Schedule No. 1, p. 2.

Figure 25 shows the sensitivity of the required ROE and equity ratio to changes in credit rating and M/B ratio. A higher credit rating requires more equity, but that equity is less risky, so it has a lower cost. For a half-grade improvement in credit rating, ROE drops 0.15%-0.17%, while a 0.05 increase in the M/B ratio equates to a 0.06% bump in ROE. In contrast, customer savings are relatively insensitive to credit rating – less than 0.1% per half-grade credit rating improvement – but more sensitive to M/B ratio and ROE – 0.17-0.19% per 0.05 bump in M/B or 0.06% in ROE. For comparison, Aquarion's proposed 10.25% ROE and 52.36% equity ratio would give the company a M/B ratio of 5.4.

Figure 25. ICSRM ROE, equity ratio, and customer cost sensitivity to credit rating and M/B targets



The foregoing analysis assumes Aquarion's existing debt is the $8.9 million outstanding after the maturation of $5 million in July 2022 and $3 million in June 2023. The first $5 million will likely be retired by the time new rates go into effect, or very shortly thereafter, so it is reasonable to exclude it from the forward-looking capital structure and average cost of debt.

The second $3 million is excluded, as well, for two reasons. First, if its interest rate is included in the average rate used to calculate the rate of return, shareholders will receive an ongoing windfall of ~$139,000 per year once the debt is refinanced in 2023 at a rate likely to

be less than half the current one, ~3.3% vs. 7.87%.[196] This is equivalent to a ~0.5% bump in ROE and +0.4 bump in M/B ratio – a substantial unearned increase in value at the unnecessary expense of customers. Second, assuming the higher interest rate remains in place over the long-term would result in an artificially conservative capital structure.

Aquarion would have to pay the higher interest rate on the outstwanding $3 million for approximately one year (a net increase of ~$138,000). But its total incremental interest cost, relative to an authorized cost of debt based on current market rates plus expected issuance costs,[197] can be reduced to less than $90,000 (approximately $65,000 after tax) by waiting to refinance the first $5 million, plus any incremental debt required to reach the target capital structure, until after the second $3 million matures, and using lower-cost short-term debt in the interim. Aquarion appears to have already implemented just such a short-term financing strategy, issuing $1.6 million of additional short-term debt in 2020.[198]

Q. What are your recommended credit rating and M/B ratio targets?

A. I recommend a target credit rating equivalent to that implied by Aquarion's proposal, midway between A2 and A3. A M/B ratio of 1.10, representing a 10% premium *in addition to* a fair and reasonable return, is appropriate and will more than compensate for flotation costs and the first-year interest shortfall.

[196] These calculations assume any incremental long-term debt beyond Aquarion's existing $13.9 million is financed at current rates (~3.3%). The windfall would be even larger if the rate was assumed equal to Aquarion's existing cost of debt, as proposed by Aquarion.
[197] As explained above, current rates are a reasonable and unbiased predictor of future rates.
[198] "Annual Report of Aquarion Water Company of New Hampshire, Year ended December 31, 2020," p. 17.

Q. What are your capital structure and rate of return recommendations?

A. My recommendations, based on the results of the ICSRM at the target credit rating and M/B ratio, are summarized in Table 17. They would yield customer savings of 17.5% relative to Aquarion's proposal.

Table 17. Recommended rate of return summary
Percent

Capital source	Amount ($)	Weight	Cost rate	Weighted cost rate
Common equity	20,705,212	57.32	4.95	2.84
Preferred equity	2,300	0.01	6.00	0.00
Short-term debt	1,200,000	3.32	2.42	0.08
Long-term debt	14,211,714	39.35	4.62	1.82
Total	**36,119,226**	**100.00**	**4.74**	**4.74**

This recommendation is conservative, in terms of its favorability to Aquarion. I previously identified two assumptions in my analysis that work in Aquarion's favor: estimating Aquarion's credit rating solely from financial metrics, ignoring a favorable regulatory environment and potential corporate parent support; and calculating the UPG's capital structure using the book, not market, value of debt, which tends to increase the unlevered COE.

My recommended ROE is higher than the UPG average COE estimated from the MS DCF and CAPM (both 4.06%). The UPG members trade at a significant premium to book value, 3.9 times, so their equity ratio on a market value basis is high – 76% on average – reducing their levered cost of equity. In contrast, Aquarion's target market-based equity ratio is lower, and its cost of equity is correspondingly higher.

IV. CLOSING REMARKS

Q. Does this conclude your testimony?

A. Yes. Thank you.

MARK E. ELLIS

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SUMMARY

Mark E. Ellis is a former utility executive now working as an independent consultant and testifying expert in finance and economics in utility regulatory proceedings. He is currently serving as a rate of return expert in California and New Hampshire. He recently testified on behalf of TURN (The Utility Reform Network) in a $7.5-billion wildfire cost securitization case in California and advised various government officials and consumer groups on the City of San Diego's utility franchise agreement renewal.

Before establishing his own consultancy, Mark led the strategy function at Sempra Energy (parent of SDG&E and SoCalGas) for fifteen years. Previously, he worked as a consultant in McKinsey's energy practice, in international project development for ExxonMobil, and in industrial demand-side management for Southern California Edison. He has an MS from MIT's Technology and Policy Program, where he focused on utility policy and conducted research in the MIT Energy Lab, and a BS in mechanical engineering from Harvard.

EXPERT TESTIMONY

Client	Utility	Description	Docket No.	Date
The Utility Reform Network	Pacific Gas & Electric	Wildfire liability self-insurance	TBD	11/21-ongoing
Protect Our Communities Foundation	Pacific Gas & Electric, San Diego Gas & Electric, Southern California Edison	Extraordinary rate of return	A.21-08-015, A.21-08-014, A.21-08-013	11/21-ongoing
New Hampshire Department of Energy	Aquarion Water Company of New Hampshire	Rate of return	DW 20-184	6/21-ongoing
The Utility Reform Network	Pacific Gas & Electric	$7.5-billion wildfire cost securitization	A.20-04-023	6/20-2/21

EDUCATION

Institution	Degree	Date
Massachusetts Institute of Technology	MS, Technology and Policy	1996
Harvard University	BS, *magna cum laude,* Mechanical and Materials Sciences and Engineering	1992

EMPLOYMENT

Company	Title	Location	Date
Self-employed	Independent consultant and testifying expert	La Jolla, CA	2019-present
Sempra Energy	Chief of Corporate Strategy	San Diego, CA	2004-2019
McKinsey & Company	Engagement Manager	Houston, TX	2000-03
ExxonMobil	Venture Development Advisor	Houston, TX	1996-2000
MIT Energy Laboratory	Research Assistant	Cambridge, MA	1994-96
Southern California Edison	Staff Engineer	Irwindale, CA	1994
Sanyo Electric Company	Research Engineer	Osaka, Japan	1992-93
Los Angeles Department of Water & Power	Seasonal Waterworks Laborer	Chatsworth, CA	1988

MARK E. ELLIS

Independent consultant and testifying expert in utility finance and economics

START-UP

Organization	Title	Description	Date
Gridware	Advisor	Y Combinator graduate developing wildfire prevention technology for electric utilities	2021-present
GATEMatrices	CEO & Founder	Created iOS app to prepare elementary-school children for gifted-and-talented education program admission tests	2013-present
Apertur	CEO & Founder	Created a technology-enabled professional development platform of workshops, assessments, toolkit, and apps to help organizations improve their culture and decision-making by reducing cognitive bias	2013-2020
Climate Policy Initiative	Power Program Director	Climate change policy advisory non-profit funded by George Soros	2010-13

NON-PROFIT BOARD

Organization	Date	Organization	Date
Harvard Club of San Diego	2015-17	Chabad Hebrew Academy	2007-14
Congregation Adat Yeshurun	2005-12	San Diego Agency for Jewish Education	2005-07

64 S.Ct. 281
51 P.U.R.(NS) 193, 320 U.S. 591, 64 S.Ct. 281, 88 L.Ed. 333
(Cite as: 51 P.U.R.(NS) 193, 64 S.Ct. 281)

Supreme Court of the United States
FEDERAL POWER COMMISSION et al.
v.
HOPE NATURAL GAS CO.
CITY OF CLEVELAND
v.
SAME.
Nos. 34 and 35.

Argued Oct. 20, 21, 1943.
Decided Jan. 3, 1944.

Separate proceedings before the Federal Power Commission by such Commission, by the City of Cleveland and the City of Akron, and by Pennsylvania Public Utility Commission wherein the State of West Virginia and its Public Service Commission were permitted to intervene concerning rates charged by Hope Natural Gas Company which were consolidated for hearing. An order fixing rates was reversed and remanded with directions by the Circuit Court of Appeals, 134 F.2d 287, and Federal Power Commission, City of Akron and Pennsylvania Public Utility Commission in one case and the City of Cleveland in another bring certiorari.

Reversed.

Mr. Justice REED, Mr. Justice FRANKFURTER and Mr. Justice JACKSON, dissenting.

On Writs of Certiorari to the United States Circuit Court of Appeals for the Fourth Circuit.

West Headnotes

[1] **Public Utilities 317A 120**

317A Public Utilities
317AII Regulation
317Ak119 Regulation of Charges
317Ak120 k. Nature and Extent in General. Most Cited Cases
(Formerly 317Ak7.1, 317Ak7)
Rate-making is only one species of price-fixing which, like other applications of the police power, may reduce the value of the property regulated, but that does not render the regulation invalid.

[2] **Public Utilities 317A 123**

317A Public Utilities
317AII Regulation
317Ak119 Regulation of Charges
317Ak123 k. Reasonableness of Charges in General. Most Cited Cases
(Formerly 317Ak7.4, 317Ak7)
Rates cannot be made to depend upon fair value, which is the end product of the process of rate-making and not the starting point, when the value of the going enterprise depends on earnings under whatever rates may be anticipated.

[3] **Gas 190 14.3(2)**

190 Gas
190k14 Charges
190k14.3 Administrative Regulation
190k14.3(2) k. Federal Power Commission. Most Cited Cases
(Formerly 190k14(1))
The rate-making function of the Federal Power Commission under the Natural Gas Act involves the making of pragmatic adjustments, and the Commission is not bound to the use of any single formula or combination of formulae in determining rates. Natural Gas Act, § § 4(a), 5(a), 6, 15 U.S.C.A. § § 717c(a), 717d(a), 717e.

[4] **Gas 190 14.5(6)**

190 Gas
190k14 Charges
190k14.5 Judicial Review and Enforcement of Regulations
190k14.5(6) k. Scope of Review and Trial De Novo. Most Cited Cases
(Formerly 190k14(1))
When order of Federal Power Commission fixing natural gas rates is challenged in the courts, the question is whether order viewed in its entirety meets the requirements of the Natural Gas Act. Natural Gas Act, § § 4(a), 5(a), 6, 19(b), 15 U.S.C.A. § § 717c(a), 717d(a), 717e, 717r(b).

[5] **Gas 190 14.4(1)**

190 Gas
190k14 Charges
190k14.4 Reasonableness of Charges

(Cite as: 51 P.U.R.(NS) 193, 64 S.Ct. 281)

190k14.4(1) k. In General. Most Cited Cases

(Formerly 190k14(1))

Under the statutory standard that natural gas rates shall be "just and reasonable" it is the result reached and not the method employed that is controlling. Natural Gas Act § § 4(a), 5(a), 15 U.S.C.A. § § 717c(a), 717d(a).

[6] **Gas 190 14.5(6)**

190 Gas
190k14 Charges
190k14.5 Judicial Review and Enforcement of Regulations
190k14.5(6) k. Scope of Review and Trial De Novo. Most Cited Cases

(Formerly 190k14(1))

If the total effect of natural gas rates fixed by Federal Power Commission cannot be said to be unjust and unreasonable, judicial inquiry under the Natural Gas Act is at an end. Natural Gas Act, § § 4(a), 5(a), 6, 19(b), 15 U.S.C.A. § § 717c(a), 717d(a), 717e, 717r(b).

[7] **Gas 190 14.5(7)**

190 Gas
190k14 Charges
190k14.5 Judicial Review and Enforcement of Regulations
190k14.5(7) k. Presumptions. Most Cited Cases

(Formerly 190k14(1))

An order of the Federal Power Commission fixing rates for natural gas is the product of expert judgment, which carries a presumption of validity, and one who would upset the rate must make a convincing showing that it is invalid because it is unjust and unreasonable in its consequences. Natural Gas Act, § § 4(a), 5(a), 6, 19(b), 15 U.S.C.A. § § 717c(a), 717d(a), 717e, 717r(b).

[8] **Gas 190 14.4(1)**

190 Gas
190k14 Charges
190k14.4 Reasonableness of Charges
190k14.4(1) k. In General. Most Cited Cases

(Formerly 190k14(1))

The fixing of just and reasonable rates for natural gas by the Federal Power Commission involves a balancing of the investor and the consumer interests. Natural Gas Act, § § 4(a), 5(a), 15 U.S.C.A. § § 717c(a), 717d(a).

[9] **Gas 190 14.4(9)**

190 Gas
190k14 Charges
190k14.4 Reasonableness of Charges
190k14.4(9) k. Depreciation and Depletion. Most Cited Cases

(Formerly 190k14(1))

As respects rates for natural gas, from the investor or company point of view it is important that there be enough revenue not only for operating expenses but also for the capital costs of the business, which includes service on the debt and dividends on stock, and by such standard the return to the equity owner should be commensurate with the terms on investments in other enterprises having corresponding risks, and such returns should be sufficient to assure confidence in the financial integrity of the enterprise so as to maintain its credit and to attract capital. Natural Gas Act, § § 4(a), 5(a), 15 U.S.C.A. § § 717c(a), 717d(a).

[10] **Gas 190 14.4(9)**

190 Gas
190k14 Charges
190k14.4 Reasonableness of Charges
190k14.4(9) k. Depreciation and Depletion. Most Cited Cases

(Formerly 190k14(1))

The fixing by the Federal Power Commission of a rate of return that permitted a natural gas company to earn $2,191,314 annually was supported by substantial evidence. Natural Gas Act, § § 4(a), 5(a), 6, 19(b), 15 U.S.C.A. § § 717c(a), 717d(a), 717e, 717r(b).

[11] **Gas 190 14.4(9)**

190 Gas
190k14 Charges
190k14.4 Reasonableness of Charges
190k14.4(9) k. Depreciation and Depletion. Most Cited Cases

(Formerly 190k14(1))

Rates which enable a natural gas company to operate successfully, to maintain its financial integrity, to attract capital and to compensate its investors for the risks assumed cannot be condemned as invalid, even though they might produce only a meager return on the so-called "fair value" rate base. Natural Gas Act,

(Cite as: 51 P.U.R.(NS) 193, 64 S.Ct. 281)

§ § 4(a), 5(a), 6, 19(b), 15 U.S.C.A. § § 717c(a), 717d(a), 717e, 717r(b).

[12] **Gas 190 14.4(4)**

190 Gas
190k14 Charges
190k14.4 Reasonableness of Charges
190k14.4(4) k. Method of Valuation. Most Cited Cases
(Formerly 190k14(1))

A return of only 3 27/100 per cent. on alleged rate base computed on reproduction cost new to natural gas company earning an annual average return of about 9 per cent. on average investment and satisfied with existing gas rates suggests an inflation of the base on which the rate had been computed, and justified Federal Power Commission in rejecting reproduction cost as the measure of the rate base. Natural Gas Act, § § 4(a), 5(a), 15 U.S.C.A. § § 717c(a), 717d(a).

[13] **Gas 190 14.4(9)**

190 Gas
190k14 Charges
190k14.4 Reasonableness of Charges
190k14.4(9) k. Depreciation and Depletion. Most Cited Cases
(Formerly 190k14(1))

There is no constitutional requirement that owner who engages in a wasting-asset business of limited life shall receive at the end more than he has put into it, and such rule is applicable to a natural gas company since the ultimate exhaustion of its supply of gas is inevitable. Natural Gas Act, § § 4(a), 5(a), 6, 19(b), 15 U.S.C.A. § § 717c(a), 717d(a), 717e, 717r(b).

[14] **Gas 190 14.4(9)**

190 Gas
190k14 Charges
190k14.4 Reasonableness of Charges
190k14.4(9) k. Depreciation and Depletion. Most Cited Cases
(Formerly 190k14(1))

In fixing natural gas rate the basing of annual depreciation on cost is proper since by such procedure the utility is made whole and the integrity of its investment is maintained, and no more is required. Natural Gas Act, § § 4(a), 5(a), 6, 19(b), 15 U.S.C.A. § § 717c(a), 717d(a), 717e, 717r(b).

[15] **Gas 190 14.3(4)**

190 Gas
190k14 Charges
190k14.3 Administrative Regulation
190k14.3(4) k. Findings and Orders. Most Cited Cases
(Formerly 190k14(1))

There are no constitutional requirements more exacting than the standards of the Natural Gas Act which are that gas rates shall be just and reasonable, and a rate order which conforms with the act is valid. Natural Gas Act, § § 4(a), 5(a), 6, 19(b), 15 U.S.C.A. § § 717c(a), 717d(a), 717e, 717r(b).

[16] **Commerce 83 62.2**

83 Commerce
83II Application to Particular Subjects and Methods of Regulation
83II(B) Conduct of Business in General
83k62.2 k. Gas. Most Cited Cases
(Formerly 83k13)

The purpose of the Natural Gas Act was to provide through the exercise of the national power over interstate commerce an agency for regulating the wholesale distribution to public service companies of natural gas moving in interstate commerce not subject to certain types of state regulation, and the act was not intended to take any authority from state commissions or to usurp state regulatory authority. Natural Gas Act, § 1 et seq., 15 U.S.C.A. § 717 et seq.

[17] **Mines and Minerals 260 92.5(3)**

260 Mines and Minerals
260III Operation of Mines, Quarries, and Wells
260III(A) Statutory and Official Regulations
260k92.5 Federal Law and Regulations
260k92.5(3) k. Oil and Gas. Most Cited Cases
(Formerly 260k92.7, 260k92)

Under the Natural Gas Act, the Federal Power Commission has no authority over the production or gathering of natural gas. Natural Gas Act, § 1(b), 15 U.S.C.A. § 717(b).

[18] **Gas 190 14.1(1)**

190 Gas
190k14 Charges
190k14.1 In General
190k14.1(1) k. In General; Amount and

(Cite as: 51 P.U.R.(NS) 193, 64 S.Ct. 281)

Regulation. Most Cited Cases
(Formerly 190k14(1))
The primary aim of the Natural Gas Act was to protect consumers against exploitation at the hands of natural gas companies and holding companies owning a majority of the pipe-line mileage which moved gas in interstate commerce and against which state commissions, independent producers and communities were growing quite helpless. Natural Gas Act, § § 4, 6-10, 14, 15 U.S.C.A. § § 717c, 717e-717i, 717m.

[19] **Gas 190 14.1(1)**

190 Gas
190k14 Charges
190k14.1 In General
190k14.1(1) k. In General; Amount and Regulation. Most Cited Cases
(Formerly 190k14(1))
Apart from the express exemptions contained in § 7 of the Natural Gas Act considerations of conservation are material where abandonment or extensions of facilities or service by natural gas companies are involved, but exploitation of consumers by private operators through maintenance of high rates cannot be continued because of the indirect benefits derived therefrom by a state containing natural gas deposits. Natural Gas Act, § § 4, 5, and § 7 as amended 15 U.S.C.A. § § 717c, 717d, 717f.

[20] **Commerce 83 62.2**

83 Commerce
83II Application to Particular Subjects and Methods of Regulation
83II(B) Conduct of Business in General
83k62.2 k. Gas. Most Cited Cases
(Formerly 83k13)
A limitation on the net earnings of a natural gas company from its interstate business is not a limitation on the power of the producing state, either to safeguard its tax revenues from such industry, or to protect the interests of those who sell their gas to the interstate operator, particularly where the return allowed the company by the Federal Power Commission was a net return after all such charges. Natural Gas Act, § § 4, 5, and § 7, as amended, 15 U.S.C.A. § § 717c, 717d, 717f.

[21] **Gas 190 14.4(1)**

190 Gas
190k14 Charges
190k14.4 Reasonableness of Charges
190k14.4(1) k. In General. Most Cited Cases
(Formerly 190k14(1))
The Natural Gas Act granting Federal Power Commission power to fix "just and reasonable rates" does not include the power to fix rates which will disallow or discourage resales for industrial use. Natural Gas Act, § § 4(a), 5(a), 15 U.S.C.A. § § 717c(a), 717d(a).

[22] **Gas 190 14.4(1)**

190 Gas
190k14 Charges
190k14.4 Reasonableness of Charges
190k14.4(1) k. In General. Most Cited Cases
(Formerly 190k14(1))
The wasting-asset nature of the natural gas industry does not require the maintenance of the level of rates so that natural gas companies can make a greater profit on each unit of gas sold. Natural Gas Act, § § 4(a), 5(a), 15 U.S.C.A. § § 717c(a), 717d(a).

[23] **Federal Courts 170B 452**

170B Federal Courts
170BVII Supreme Court
170BVII(B) Review of Decisions of Courts of Appeals
170Bk452 k. Certiorari in General. Most Cited Cases
(Formerly 106k383(1))
Where the Federal Power Commission made no findings as to any discrimination or unreasonable differences in rates, and its failure was not challenged in the petition to review, and had not been raised or argued by any party, the problem of discrimination was not open to review by the Supreme Court on certiorari. Natural Gas Act, § 4(b), 15 U.S.C.A. § 717c(b).

[24] **Constitutional Law 92 74**

92 Constitutional Law
92III Distribution of Governmental Powers and Functions
92III(B) Judicial Powers and Functions
92k71 Encroachment on Executive
92k74 k. Powers, Duties, and Acts Under Legislative Authority. Most Cited Cases
(Formerly 15Ak226)
Congress has entrusted the administration of the

(Cite as: 51 P.U.R.(NS) 193, 64 S.Ct. 281)

Natural Gas Act to the Federal Power Commission and not to the courts, and apart from the requirements of judicial review, it is not for the Supreme Court to advise the Commission how to discharge its functions. Natural Gas Act, § § 1 et seq., 19(b), 15 U.S.C.A. § § 717 et seq., 717r(b).

[25] **Gas 190 14.5(3)**

190 Gas
190k14 Charges
190k14.5 Judicial Review and Enforcement of Regulations
190k14.5(3) k. Decisions Reviewable. Most Cited Cases
(Formerly 190k14(1))
Under the Natural Gas Act, where order sought to be reviewed does not of itself adversely affect complainant but only affects his rights adversely on the contingency of future administrative action, the order is not reviewable, and resort to the courts in such situation is either premature or wholly beyond the province of such courts. Natural Gas Act, § 19(b), 15 U.S.C.A. § 717r(b).

[26] **Gas 190 14.5(4)**

190 Gas
190k14 Charges
190k14.5 Judicial Review and Enforcement of Regulations
190k14.5(4) k. Persons Entitled to Relief; Parties. Most Cited Cases
(Formerly 190k14(1))
Findings of the Federal Power Commission on lawfulness of past natural gas rates, which the Commission was without power to enforce, were not reviewable under the Natural Gas Act giving any "party aggrieved" by an order of the Commission the right of review. Natural Gas Act, § 19(b), 15 U.S.C.A. § 717r(b).

****283 *592** Mr. Francis M. Shea, Asst. Atty. Gen., for petitioners Federal Power Com'n and others.
***593** Mr. Spencer W. Reeder, of Cleveland, Ohio, for petitioner City of cleveland.
Mr. William B. Cockley, of Cleveland, Ohio, for respondent.
Mr. M. M. Neeley, of Charleston, W. Va., for State of West Virginia, as amicus curiae by special leave of Court.

Mr. Justice DOUGLAS delivered the opinion of the Court.
The primary issue in these cases concerns the validity under the Natural Gas Act of 1938, 52 Stat. 821, 15 U.S.C. s 717 et seq., 15 U.S.C.A. s 717 et seq., of a rate order issued by the Federal Power Commission reducing the rates chargeable by Hope Natural Gas Co., 44 P.U.R.,N.S., 1. On a petition for review of the order made pursuant to s 19(b) of the Act, the ***594** Circuit Court of Appeals set it aside, one judge dissenting. 4 Cir., 134 F.2d 287. The cases ****284** are here on petitions for writs of certiorari which we granted because of the public importance of the questions presented. City of Cleveland v. Hope Natural Gas Co., 319 U.S. 735, 63 S.Ct. 1165.

Hope is a West Virginia corporation organized in 1898. It is a wholly owned subsidiary of Standard Oil Co. (N.J.). Since the date of its organization, it has been in the business of producing, purchasing and marketing natural gas in that state. FN1 It sells some of that gas to local consumers in West Virginia. But the great bulk of it goes to five customer companies which receive it at the West Virginia line and distribute it in Ohio and in Pennsylvania. FN2 In July, 1938, the cities of Cleveland and Akron filed complaints with the Commission charging that the rates collected by Hope from East Ohio Gas Co. (an affiliate of Hope which distributes gas in Ohio) were excessive and unreasonable. Later in 1938 the Commission on its own motion instituted an investigation to determine the reasonableness of all of Hope's interstate rates. In March ***595** 1939 the Public Utility Commission of Pennsylvania filed a complaint with the Commission charging that the rates collected by Hope from Peoples Natural Gas Co. (an affiliate of Hope distributing gas in Pennsylvania) and two non-affiliated companies were unreasonable. The City of Cleveland asked that the challenged rates be declared unlawful and that just and reasonable rates be determined from June 30, 1939 to the date of the Commission's order. The latter finding was requested in aid of state regulation and to afford the Public Utilities Commission of Ohio a proper basic for disposition of a fund collected by East Ohio under bond from Ohio consumers since June 30, 1939. The cases were consolidated and hearings were held.

FN1 Hope produces about one-third of its annual gas requirements and purchases the rest under some 300 contracts.

FN2 These five companies are the East Ohio Gas Co., the Peoples Natural Gas Co., the

River Gas Co., the Fayette County Gas Co., and the Manufacturers Light & Heat Co. The first three of these companies are, like Hope, subsidiaries of Standard Oil Co. (N.J.). East Ohio and River distribute gas in Ohio, the other three in Pennsylvania. Hope's approximate sales in m.c.f. for 1940 may be classified as follows:

Local West Virginia. sales.	11,000,000
East Ohio.	40,000,000
Peoples.	10,000,000
River.	400,000
Fayette.	860,000
Manufacturers.	2,000,000

Local West Virginia

Hope's natural gas is processed by Hope Construction & Refining Co., an affiliate, for the extraction of gasoline and butane. Domestic Coke Corp., another affiliate, sells coke-oven gas to Hope for boiler fuel.

On May 26, 1942, the Commission entered its order and made its findings. Its order required Hope to decrease its future interstate rates so as to reflect a reduction, on an annual basis of not less than $3,609,857 in operating revenues. And it established 'just and reasonable' average rates per m.c.f. for each of the five customer companies. [FN3] In response to the prayer of the City of Cleveland the Commission also made findings as to the lawfulness of past rates, although concededly it had no authority under the Act to fix past rates or to award reparations. 44 P.U.R.,U.S., at page 34. It found that the rates collected by Hope from East Ohio were unjust, unreasonable, excessive and therefore unlawful, by $830,892 during 1939, $3,219,551 during 1940, and $2,815,789 on an annual basis since 1940. It further found that just, reasonable, and lawful rates for gas sold by Hope to East Ohio for resale for ultimate public consumption were those required ***596** to produce $11,528,608 for 1939, $11,507,185 for 1940 and $11.910,947 annually since 1940.

FN3 These required minimum reductions of 7¢ per m.c.f. from the 36.5¢ and 35.5¢ rates previously charged East Ohio and Peoples, respectively, and 3¢ per m.c.f. from the 31.5¢ rate previously charged Fayette and Manufacturers.

The Commission established an interstate rate base of $33,712,526 which, it found, represented the 'actual legitimate cost' of the company's interstate property less depletion and depreciation and plus unoperated acreage, working capital and future net capital additions. The Commission, beginning with book cost, made ****285** certain adjustments not necessary to relate here and found the 'actual legitimate cost' of the plant in interstate service to be $51,957,416, as of December 31, 1940. It deducted accrued depletion and depreciation, which it found to be $22,328,016 on an 'economic-service-life' basis. And it added $1,392,021 for future net capital additions, $566,105 for useful unoperated acreage, and $2,125,000 for working capital. It used 1940 as a test year to estimate future revenues and expenses. It allowed over $16,000,000 as annual operating expenses-about $1,300,000 for taxes, $1,460,000 for depletion and depreciation, $600,000 for exploration and development costs, $8,500,000 for gas purchased. The Commission allowed a net increase of $421,160 over 1940 operating expenses, which amount was to take care of future increase in wages, in West Virginia property taxes, and in exploration and development costs. The total amount of deductions allowed from interstate revenues was $13,495,584.

Hope introduced evidence from which it estimated reproduction cost of the property at $97,000,000. It also presented a so-called trended 'original cost' estimate which exceeded $105,000,000. The latter was designed 'to indicate what the original cost of the property would have been if 1938 material and labor prices had prevailed throughout the whole period of the piece-meal construction of the company's property since 1898.' 44 P.U.R.,N.S., at pages 8, 9. Hope estimated by the 'percent condition' method accrued depreciation at about 35% of ***597** reproduction cost new. On that basis Hope contended for a rate base of $66,000,000. The Commission refused to place any reliance on reproduction cost new, saying that it was 'not predicated upon facts' and was 'too conjectural and illusory to be given any weight in these proceedings.' Id., 44 P.U.R.,U.S., at page 8. It likewise refused to give any 'probative value' to trended 'original cost' since it was 'not founded in fact' but was 'basically erroneous' and produced 'irrational results.' Id., 44 P.U.R., N.S., at page 9. In determining the amount of accrued depletion and depreciation the Commission, following Lindheimer v. Illinois Bell

Telephone Co., 292 U.S. 151, 167-169, 54 S.Ct. 658, 664-666, 78 L.Ed. 1182; Federal Power Commission v. Natural Gas Pipeline Co., 315 U.S. 575, 592, 593, 62 S.Ct. 736, 745, 746, 86 L.Ed. 1037, based its computation on 'actual legitimate cost'. It found that Hope during the years when its business was not under regulation did not observe 'sound depreciation and depletion practices' but 'actually accumulated an excessive reserve' [FN4] of about $46,000,000. Id., 44 P.U.R.,N.S., at page 18. One member of the Commission thought that the entire amount of the reserve should be deducted from 'actual legitimate cost' in determining the rate base. [FN5] The majority of the ***598** Commission concluded, however, that where, as here, a business is brought under regulation for the first time and where incorrect depreciation and depletion practices have prevailed, the deduction of the reserve requirement (actual existing depreciation and depletion) rather than the excessive reserve should be made so as to ****286** lay 'a sound basis for future regulation and control of rates.' Id., 44 P.U.R.,N.S., at page 18. As we have pointed out, it determined accrued depletion and depreciation to be $22,328,016; and it allowed approximately $1,460,000 as the annual operating expense for depletion and depreciation. [FN6]

FN4 The book reserve for interstate plant amounted at the end of 1938 to about $18,000,000 more than the amount determined by the Commission as the proper reserve requirement. The Commission also noted that 'twice in the past the company has transferred amounts aggregating $7,500,000 from the depreciation and depletion reserve to surplus. When these latter adjustments are taken into account, the excess becomes $25,500,000, which has been exacted from the ratepayers over and above the amount required to cover the consumption of property in the service rendered and thus to keep the investment unimpaired.' 44 P.U.R.,N.S., at page 22.

FN5 That contention was based on the fact that 'every single dollar in the depreciation and depletion reserves' was taken 'from gross operating revenues whose only source was the amounts charged customers in the past for natural gas. It is, therefore, a fact that the depreciation and depletion reserves have been contributed by the customers and do not represent any investment by Hope.' Id., 44 P.U.R.,N.S., at page 40. And see Railroad Commission v. Cumberland Tel. & T. Co., 212 U.S. 414, 424, 425, 29 S.Ct. 357, 361, 362, 53 L.Ed. 577; 2 Bonbright, Valuation of Property (1937), p. 1139.

FN6 The Commission noted that the case was 'free from the usual complexities involved in the estimate of gas reserves because the geologists for the company and the Commission presented estimates of the remaining recoverable gas reserves which were about one per cent apart.' 44 P.U.R.,N.S., at pages 19, 20.

The Commission utilized the 'straight-line-basis' for determining the depreciation and depletion reserve requirements. It used estimates of the average service lives of the property by classes based in part on an inspection of the physical condition of the property. And studies were made of Hope's retirement experience and maintenance policies over the years. The average service lives of the various classes of property were converted into depreciation rates and then applied to the cost of the property to ascertain the portion of the cost which had expired in rendering the service.

The record in the present case shows that Hope is on the lookout for new sources of supply of natural gas and is contemplating an extension of its pipe line into Louisiana for that purpose. The Commission recognized in fixing the rates of depreciation that much material may be used again when various present sources of gas supply are exhausted, thus giving that property more than scrap value at the end of its present use.

Hope's estimate of original cost was about $69,735,000-approximately $17,000,000 more than the amount found by the Commission. The item of $17,000,000 was made up largely of expenditures which prior to December 31, 1938, were charged to operating expenses. Chief among those expenditures was some $12,600,000 expended ***599** in well-drilling prior to 1923. Most of that sum was expended by Hope for labor, use of drilling-rigs, hauling, and similar costs of well-drilling. Prior to 1923 Hope followed the general practice of the natural gas industry and charged the cost of drilling wells to operating expenses. Hope continued that practice until the Public Service Commission of West Virginia in 1923 required it to capitalize such expenditures, as does the Commission under its present Uniform System of Accounts. [FN7] The Commission refused to add such items to the rate base stating that 'No greater injustice to consumers could be done than to allow items as operating expenses and at a later date include them in the rate base, thereby placing multiple charges upon the consumers.' Id., 44 P.U.R.,N.S., at page 12. For the same reason the Commission excluded from the rate base about $1,600,000 of expenditures on properties which Hope acquired from other utilities, the latter having charged those payments to operating expenses. The Commission disallowed certain other overhead items amounting to

over $3,000,000 which also had been previously charged to operating expenses. And it refused to add some $632,000 as interest during construction since no interest was in fact paid.

FN7 See Uniform System of Accounts prescribed for Natural Gas Companies effective January 1, 1940, Account No. 332.1.

Hope contended that it should be allowed a return of not less than 8%. The Commission found that an 8% return would be unreasonable but that 6 1/2% was a fair rate of return. That rate of return, applied to the rate base of $33,712,526, would produce $2,191,314 annually, as compared with the present income of not less than $5,801,171.

The Circuit Court of Appeals set aside the order of the Commission for the following reasons. (1) It held that the rate base should reflect the 'present fair value' of the ***600** property, that the Commission in determining the 'value' should have considered reproduction cost and trended original cost, and that 'actual legitimate cost' (prudent investment) was not the proper measure of 'fair value' where price levels had changed since the investment. (2) It concluded that the well-drilling costs and overhead items in the amount of some $17,000,000 should have been included in the rate base. (3) It held that accrued depletion and depreciation and the annual allowance for that expense should be computed on the basis of 'present fair value' of the property not on the basis of 'actual legitimate cost'.

****287** The Circuit Court of Appeals also held that the Commission had no power to make findings as to past rates in aid of state regulation. But it concluded that those findings were proper as a step in the process of fixing future rates. Viewed in that light, however, the findings were deemed to be invalidated by the same errors which vitiated the findings on which the rate order was based.

Order Reducing Rates. Congress has provided in s 4(a) of the Natural Gas Act that all natural gas rates subject to the jurisdiction of the Commission 'shall be just and reasonable, and any such rate or charge that is not just and reasonable is hereby declared to be unlawful.' Sec. 5(a) gives the Commission the power, after hearing, to determine the 'just and reasonable rate' to be thereafter observed and to fix the rate by order. Sec. 5(a) also empowers the Commission to order a 'decrease where existing rates are unjust * * * unlawful, or are not the lowest reasonable rates.' And Congress has provided in s 19(b) that on review of these rate orders the 'finding of the Commission as to the facts, if supported by substantial evidence, shall be conclusive.' Congress, however, has provided no formula by which the 'just and reasonable' rate is to be determined. It has not filled in the ***601** details of the general prescription FN8 of s 4(a) and s 5(a). It has not expressed in a specific rule the fixed principle of 'just and reasonable'.

FN8. Sec. 6 of the Act comes the closest to supplying any definite criteria for rate making. It provides in subsection (a) that, 'The Commission may investigate the ascertain the actual legitimate cost of the property of every natural-gas company, the depreciation therein, and, when found necessary for rate-making purposes, other facts which bear on the determination of such cost or depreciation and the fair value of such property.' Subsection (b) provides that every natural-gas company on request shall file with the Commission a statement of the 'original cost' of its property and shall keep the Commission informed regarding the 'cost' of all additions, etc.

[1] [2] When we sustained the constitutionality of the Natural Gas Act in the Natural Gas Pipeline Co. case, we stated that the 'authority of Congress to regulate the prices of commodities in interstate commerce is at least as great under the Fifth Amendment as is that of the states under the Fourteenth to regulate the prices of commodities in intrastate commerce.' 315 U.S. at page 582, 62 S.Ct. at page 741, 86 L.Ed. 1037. Rate-making is indeed but one species of price-fixing. Munn v. Illinois, 94 U.S. 113, 134, 24 L.Ed. 77. The fixing of prices, like other applications of the police power, may reduce the value of the property which is being regulated. But the fact that the value is reduced does not mean that the regulation is invalid. Block v. Hirsh, 256 U.S. 135, 155-157, 41 S.Ct. 458, 459, 460, 65 L.Ed. 865, 16 A.L.R. 165; Nebbia v. New York, 291 U.S. 502, 523-539, 54 S.Ct. 505, 509-517, 78 L.Ed. 940, 89 A.L.R. 1469, and cases cited. It does, however, indicate that 'fair value' is the end product of the process of rate-making not the starting point as the Circuit Court of Appeals held. The heart of the matter is that rates cannot be made to depend upon 'fair value' when the value of the going enterprise depends on earnings under whatever rates may be anticipated. FN9

FN9 We recently stated that the meaning of the word 'value' is to be gathered 'from the purpose for which a valuation is being made. Thus the question in a valuation for rate making is how much a utility will be allowed to earn. The basic

> question in a valuation for reorganization purposes is how much the enterprise in all probability can earn.' Institutional Investors v. Chicago, M., St. P. & P.R. Co., 318 U.S. 523, 540, 63 S.Ct. 727, 738.

***602** [3] [4] [5] [6] [7] We held in Federal Power Commission v. Natural Gas Pipeline Co., supra, that the Commission was not bound to the use of any single formula or combination of formulae in determining rates. Its rate-making function, moreover, involves the making of 'pragmatic adjustments.' Id., 315 U.S. at page 586, 62 S.Ct. at page 743, 86 L.Ed. 1037. And when the Commission's order is challenged in the courts, the question is whether that order 'viewed in its entirety' meets the requirements of the Act. Id., 315 U.S. at page 586, 62 S.Ct. at page 743, 86 L.Ed. 1037. Under the statutory standard of 'just and reasonable' it is the result reached not the method employed which is controlling. Cf. ****288**Los Angeles Gas & Electric Corp. v. Railroad Commission, 289 U.S. 287, 304, 305, 314, 53 S.Ct. 637, 643, 644, 647, 77 L.Ed. 1180; West Ohio Gas Co. v. Public Utilities Commission (No. 1), 294 U.S. 63, 70, 55 S.Ct. 316, 320, 79 L.Ed. 761; West v. Chesapeake & Potomac Tel. Co., 295 U.S. 662, 692, 693, 55 S.Ct. 894, 906, 907, 79 L.Ed. 1640 (dissenting opinion). It is not theory but the impact of the rate order which counts. If the total effect of the rate order cannot be said to be unjust and unreasonable, judicial inquiry under the Act is at an end. The fact that the method employed to reach that result may contain infirmities is not then important. Moreover, the Commission's order does not become suspect by reason of the fact that it is challenged. It is the product of expert judgment which carries a presumption of validity. And he who would upset the rate order under the Act carries the heavy burden of making a convincing showing that it is invalid because it is unjust and unreasonable in its consequences. Cf. Railroad Commission v. Cumberland Tel. & T. Co., 212 U.S. 414, 29 S.Ct. 357, 53 L.Ed. 577; Lindheimer v. Illinois Bell Tel. Co., supra, 292 U.S. at pages 164, 169, 54 S.Ct. at pages 663, 665, 78 L.Ed. 1182; Railroad Commission v. Pacific Gas & E. Co., 302 U.S. 388, 401, 58 S.Ct. 334, 341, 82 L.Ed. 319.

***603** [8] [9] The rate-making process under the Act, i.e., the fixing of 'just and reasonable' rates, involves a balancing of the investor and the consumer interests. Thus we stated in the Natural Gas Pipeline Co. case that 'regulation does not insure that the business shall produce net revenues.' 315 U.S. at page 590, 62 S.Ct. at page 745, 86 L.Ed. 1037. But such considerations aside, the investor interest has a legitimate concern with the financial integrity of the company whose rates are being regulated. From the investor or company point of view it is important that there be enough revenue not only for operating expenses but also for the capital costs of the business. These include service on the debt and dividends on the stock. Cf. Chicago & Grand Trunk R. Co. v. Wellman, 143 U.S. 339, 345, 346, 12 S.Ct. 400, 402, 36 L.Ed. 176. By that standard the return to the equity owner should be commensurate with returns on investments in other enterprises having corresponding risks. That return, moreover, should be sufficient to assure confidence in the financial integrity of the enterprise, so as to maintain its credit and to attract capital. See State of Missouri ex rel. South-western Bell Tel. Co. v. Public Service Commission, 262 U.S. 276, 291, 43 S.Ct. 544, 547, 67 L.Ed. 981, 31 A.L.R. 807 (Mr. Justice Brandeis concurring). The conditions under which more or less might be allowed are not important here. Nor is it important to this case to determine the various permissible ways in which any rate base on which the return is computed might be arrived at. For we are of the view that the end result in this case cannot be condemned under the Act as unjust and unreasonable from the investor or company viewpoint.

We have already noted that Hope is a wholly owned subsidiary of the Standard Oil Co. (N.J.). It has no securities outstanding except stock. All of that stock has been owned by Standard since 1908. The par amount presently outstanding is approximately $28,000,000 as compared with the rate base of $33,712,526 established by ***604** the Commission. Of the total outstanding stock $11,000,000 was issued in stock dividends. The balance, or about $17,000,000, was issued for cash or other assets. During the four decades of its operations Hope has paid over $97,000,000 in cash dividends. It had, moreover, accumulated by 1940 an earned surplus of about $8,000,000. It had thus earned the total investment in the company nearly seven times. Down to 1940 it earned over 20% per year on the average annual amount of its capital stock issued for cash or other assets. On an average invested capital of some $23,000,000 Hope's average earnings have been about 12% a year. And during this period it had accumulated in addition reserves for depletion and depreciation of about $46,000,000. Furthermore, during 1939, 1940 and 1941, Hope paid dividends of 10% on its stock. And in the year 1942, during about half of which the lower rates were in effect, it paid dividends of 7 1/2%. From 1939-1942 its earned surplus increased from $5,250,000 to about $13,700,000, i.e., to almost half the par value of its outstanding stock.

As we have noted, the Commission fixed a rate of return which permits Hope to earn $2,191,314 annually. In determining that amount it stressed the importance of maintaining the financial integrity of the ****289** company. It considered the financial history of Hope and a vast

array of data bearing on the natural gas industry, related businesses, and general economic conditions. It noted that the yields on better issues of bonds of natural gas companies sold in the last few years were 'close to 3 per cent', 44 P.U.R.,N.S., at page 33. It stated that the company was a 'seasoned enterprise whose risks have been minimized' by adequate provisions for depletion and depreciation (past and present) with 'concurrent high profits', by 'protected established markets, through affiliated distribution companies, in populous and industralized areas', and by a supply of gas locally to meet all requirements,***605** 'except on certain peak days in the winter, which it is feasible to supplement in the future with gas from other sources.' Id., 44 P.U.R.,N.S., at page 33. The Commission concluded, 'The company's efficient management, established markets, financial record, affiliations, and its prospective business place it in a strong position to attract capital upon favorable terms when it is required.' Id., 44 P.U.R.,N.S., at page 33.

[10] [11] [12] In view of these various considerations we cannot say that an annual return of $2,191,314 is not 'just and reasonable' within the meaning of the Act. Rates which enable the company to operate successfully, to maintain its financial integrity, to attract capital, and to compensate its investors for the risks assumed certainly cannot be condemned as invalid, even though they might produce only a meager return on the so-called 'fair value' rate base. In that connection it will be recalled that Hope contended for a rate base of $66,000,000 computed on reproduction cost new. The Commission points out that if that rate base were accepted, Hope's average rate of return for the four-year period from 1937-1940 would amount to 3.27%. During that period Hope earned an annual average return of about 9% on the average investment. It asked for no rate increases. Its properties were well maintained and operated. As the Commission says such a modest rate of 3.27% suggests an 'inflation of the base on which the rate has been computed.' Dayton Power & Light Co. v. Public Utilities Commission, 292 U.S. 290, 312, 54 S.Ct. 647, 657, 78 L.Ed. 1267. Cf. Lindheimer v. Illinois Bell Tel. Co., supra, 292 U.S. at page 164, 54 S.Ct. at page 663, 78 L.Ed. 1182. The incongruity between the actual operations and the return computed on the basis of reproduction cost suggests that the Commission was wholly justified in rejecting the latter as the measure of the rate base.

In view of this disposition of the controversy we need not stop to inquire whether the failure of the Commission to add the $17,000,000 of well-drilling and other costs to ***606** the rate base was consistent with the prudent investment theory as developed and applied in particular cases.

[13] [14] [15] Only a word need be added respecting depletion and depreciation. We held in the Natural Gas Pipeline Co. case that there was no constitutional requirement 'that the owner who embarks in a wasting-asset business of limited life shall receive at the end more than he has put into it.' 315 U.S. at page 593, 62 S.C. at page 746, 86 L.Ed. 1037. The Circuit Court of Appeals did not think that that rule was applicable here because Hope was a utility required to continue its service to the public and not scheduled to end its business on a day certain as was stipulated to be true of the Natural Gas Pipeline Co. But that distinction is quite immaterial. The ultimate exhaustion of the supply is inevitable in the case of all natural gas companies. Moreover, this Court recognized in Lindheimer v. Illinois Bell Tel. Co., supra, the propriety of basing annual depreciation on cost. FN10 By such a procedure the ****290** utility is made whole and the integrity of its investment maintained. FN11 No more is required. FN12 We cannot approve the contrary holding ***607** of United Railways & Electric Co. v. West, 280 U.S. 234, 253, 254, 50 S.Ct. 123, 126, 127, 74 L.Ed. 390. Since there are no constitutional requirements more exacting than the standards of the Act, a rate order which conforms to the latter does not run afoul of the former.

FN10 Chief Justice Hughes said in that case (292 U.S. at pages 168, 169, 54 S.Ct. at page 665, 78 L.Ed. 1182): 'If the predictions of service life were entirely accurate and retirements were made when and as these predictions were precisely fulfilled, the depreciation reserve would represent the consumption of capital, on a cost basis, according to the method which spreads that loss over the respective service periods. But if the amounts charged to operating expenses and credited to the account for depreciation reserve are excessive, to that extent subscribers for the telephone service are required to provide, in effect, capital contributions, not to make good losses incurred by the utility in the service rendered and thus to keep its investment unimpaired, but to secure additional plant and equipment upon which the utility expects a return.'

FN11 See Mr. Justice Brandeis (dissenting) in United Railways & Electric Co. v. West, 280 U.S. 234, 259-288, 50 S.Ct. 123, 128-138, 74 L.Ed. 390, for an extended analysis of the problem.

FN12 It should be noted that the Act provides no specific rule governing depletion and depreciation. Sec. 9(a) merely states that the

> Commission 'may from time to time ascertain and determine, and by order fix, the proper and adequate rates of depreciation and amortization of the several classes of property of each natural-gas company used or useful in the production, transportation, or sale of natural gas.'

The Position of West Virginia. The State of West Virginia, as well as its Public Service Commission, intervened in the proceedings before the Commission and participated in the hearings before it. They have also filed a brief amicus curiae here and have participated in the argument at the bar. Their contention is that the result achieved by the rate order 'brings consequences which are unjust to West Virginia and its citizens' and which 'unfairly depress the value of gas, gas lands and gas leaseholds, unduly restrict development of their natural resources, and arbitrarily transfer their properties to the residents of other states without just compensation therefor.'

West Virginia points out that the Hope Natural Gas Co. holds a large number of leases on both producing and unoperated properties. The owner or grantor receives from the operator or grantee delay rentals as compensation for postponed drilling. When a producing well is successfully brought in, the gas lease customarily continues indefinitely for the life of the field. In that case the operator pays a stipulated gas-well rental or in some cases a gas royalty equivalent to one-eighth of the gas marketed. FN13 Both the owner and operator have valuable property interests in the gas which are separately taxable under West Virginia law. The contention is that the reversionary interests in the leaseholds should be represented in the rate proceedings since it is their gas which is being sold in interstate ***608** commerce. It is argued, moreover, that the owners of the reversionary interests should have the benefit of the 'discovery value' of the gas leaseholds, not the interstate consumers. Furthermore, West Virginia contends that the Commission in fixing a rate for natural gas produced in that State should consider the effect of the rate order on the economy of West Virginia. It is pointed out that gas is a wasting asset with a rapidly diminishing supply. As a result West Virginia's gas deposits are becoming increasingly valuable. Nevertheless the rate fixed by the Commission reduces that value. And that reduction, it is said, has severe repercussions on the economy of the State. It is argued in the first place that as a result of this rate reduction Hope's West Virginia property taxes may be decreased in view of the relevance which earnings have under West Virginia law in the assessment of property for tax purposes. FN14 Secondly, it is pointed out that West Virginia has a production tax FN15 on the 'value' of the gas exported from the State. And we are told that for purposes of that tax 'value' becomes under West Virginia law 'practically the substantial equivalent of market value.' Thus West Virginia argues that undervaluation of Hope's gas leaseholds will cost the State many thousands of dollars in taxes. The effect, it is urged, is to impair West Virginia's tax structure for the benefit of Ohio and Pennsylvania consumers. West Virginia emphasizes, moreover, its deep interest in the conservation of its natural resources including its natural gas. It says that a reduction of the value of these leasehold values will jeopardize these conservation policies in three respects: (1) ****291** exploratory development of new fields will be discouraged; (2) abandonment of lowyield high-cost marginal wells will be hastened; and (3) secondary recovery of oil will be hampered. ***609** Furthermore, West Virginia contends that the reduced valuation will harm one of the great industries of the State and that harm to that industry must inevitably affect the welfare of the citizens of the State. It is also pointed out that West Virginia has a large interest in coal and oil as well as in gas and that these forms of fuel are competitive. When the price of gas is materially cheapened, consumers turn to that fuel in preference to the others. As a result this lowering of the price of natural gas will have the effect of depreciating the price of West Virginia coal and oil.

> FN13 See Simonton, The Nature of the Interest of the Grantee Under an Oil and Gas Lease (1918), 25 W.Va.L.Quar. 295.
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> FN14 West Penn Power Co. v. Board of Review, 112 W.Va. 442, 164 S.E. 862.
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> FN15 W.Va.Rev.Code of 1943, ch. 11. Art. 13, ss 2a, 3a.

West Virginia insists that in neglecting this aspect of the problem the Commission failed to perform the function which Congress entrusted to it and that the case should be remanded to the Commission for a modification of its order. FN16

> FN16 West Virginia suggests as a possible solution (1) that a 'going concern value' of the company's tangible assets be included in the rate base and (2) that the fair market value of gas delivered to customers be added to the outlay for operating expenses and taxes.

We have considered these contentions at length in view of the earnestness with which they have been urged upon us. We have searched the legislative history of the Natural

Gas Act for any indication that Congress entrusted to the Commission the various considerations which West Virginia has advanced here. And our conclusion is that Congress did not.

[16] [17] We pointed out in Illinois Natural Gas Co. v. Central Illinois Public Service Co., 314 U.S. 498, 506, 62 S.Ct. 384, 387, 86 L.Ed. 371, that the purpose of the Natural Gas Act was to provide, 'through the exercise of the national power over interstate commerce, an agency for regulating the wholesale distribution to public service companies of natural gas moving interstate, which this Court had declared to be interstate commerce not subject to certain types of state regulation.' As stated in the House Report the 'basic purpose' of this legislation was 'to occupy' the field in which such cases as ***610**State of Missouri v. Kansas Natural Gas Co., 265 U.S. 298, 44 S.Ct. 544, 68 L.Ed. 1027, and Public Utilities Commission v. Attleboro Steam & Electric Co., 273 U.S. 83, 47 S.Ct. 294, 71 L.Ed. 549, had held the States might not act. H.Rep. No. 709, 75th Cong., 1st Sess., p. 2. In accomplishing that purpose the bill was designed to take 'no authority from State commissions' and was 'so drawn as to complement and in no manner usurp State regulatory authority.' Id., p. 2. And the Federal Power Commission was given no authority over the 'production or gathering of natural gas.' s 1(b).

[18] The primary aim of this legislation was to protect consumers against exploitation at the lands of natural gas companies. Due to the hiatus in regulation which resulted from the Kansas Natural Gas Co. case and related decisions state commissions found it difficult or impossible to discover what it cost interstate pipe-line companies to deliver gas within the consuming states; and thus they were thwarted in local regulation. H.Rep., No. 709, supra, p. 3. Moreover, the investigations of the Federal Trade Commission had disclosed that the majority of the pipe-line mileage in the country used to transport natural gas, together with an increasing percentage of the natural gas supply for pipe-line transportation, had been acquired by a handful of holding companies. FN17 State commissions, independent producers, and communities having or seeking the service were growing quite helpless against these combinations. FN18 These were the types of problems with which those participating in the hearings were pre-occupied. FN19 Congress addressed itself to those specific evils.

FN17 S.Doc. 92, Pt. 84-A, ch. XII, Final Report, Federal Trade Commission to the Senate pursuant to S.Res.No. 83, 70th Cong., 1st Sess.

FN18 S.Doc. 92, Pt. 84-A, chs. XII, XIII, op. cit., supra, note 17.

FN19 See Hearings on H.R. 11662, Subcommittee of House Committee on Interstate & Foreign Commerce, 74th Cong., 2d Sess.; Hearings on H.R. 4008, House Committee on Interstate & Foreign Commerce, 75th Cong., 1st Sess.

611** The Federal Power Commission was given*292** broad powers of regulation. The fixing of 'just and reasonable' rates (s 4) with the powers attendant thereto FN20 was the heart of the new regulatory system. Moreover, the Commission was given certain authority by s 7(a), on a finding that the action was necessary or desirable 'in the public interest,' to require natural gas companies to extend or improve their transportation facilities and to sell gas to any authorized local distributor. By s 7(b) it was given control over the abandonment of facilities or of service. And by s 7(c), as originally enacted, no natural gas company could undertake the construction or extension of any facilities for the transportation of natural gas to a market in which natural gas was already being served by another company, or sell any natural gas in such a market, without obtaining a certificate of public convenience and necessity from the Commission. In passing on such applications for certificates of convenience and necessity the Commission was told by s 7(c), as originally enacted, that it was 'the intention of Congress that natural gas shall be sold in interstate commerce for resale for ultimate public consumption for domestic, commercial, industrial, or any other use at the lowest possible reasonable rate consistent with the maintenance of adequate service in the public interest.' The latter provision was deleted from s 7(c) when that subsection was amended by the Act of February 7, 1942, 56 Stat. 83. By that amendment limited grandfather rights were granted companies desiring to extend their facilities and services over the routes or within the area which they were already serving. Moreover, s 7(c) was broadened so as to require certificates***612** of public convenience and necessity not only where the extensions were being made to markets in which natural gas was already being sold by another company but in other situations as well.

FN20 The power to investigate and ascertain the 'actual legitimate cost' of property (s 6), the requirement as to books and records (s 8), control over rates of depreciation (s 9), the requirements for periodic and special reports (s 10), the broad powers of investigation (s 14) are among the chief powers supporting the rate making function.

[19] These provisions were plainly designed to protect the consumer interests against exploitation at the hands of private natural gas companies. When it comes to cases of abandonment or of extensions of facilities or service, we may assume that, apart from the express exemptions [FN21] contained in s 7, considerations of conservation are material to the issuance of certificates of public convenience and necessity. But the Commission was not asked here for a certificate of public convenience and necessity under s 7 for any proposed construction or extension. It was faced with a determination of the amount which a private operator should be allowed to earn from the sale of natural gas across state lines through an established distribution system. Secs. 4 and 5, not s 7, provide the standards for that determination. We cannot find in the words of the Act or in its history the slightest intimation or suggestion that the exploitation of consumers by private operators through the maintenance of high rates should be allowed to continue provided the producing states obtain indirect benefits from it. That apparently was the Commission's view of the matter, for the same arguments advanced here were presented to the Commission and not adopted by it.

FN21 Apart from the grandfather clause contained in s 7(c), there is the provision of s 7(f) that a natural gas company may enlarge or extend its facilities with the 'service area' determined by the Commission without any further authorization.

We do not mean to suggest that Congress was unmindful of the interests of the producing states in their natural gas supplies when it drafted the Natural Gas Act. As we have said, the Act does not intrude on the domain traditionally reserved for control by state commissions; and the Federal Power Commission was given no authority over***613** 'the production or gathering of natural gas.' s 1(b). In addition, Congress recognized the legitimate interests of the States in the conservation of natural gas. By s 11 Congress instructed the Commission to make reports on compacts between two or more States dealing with the conservation, production and transportation of natural gas. [FN22] The Commission was also ****293** directed to recommend further legislation appropriate or necessary to carry out any proposed compact and 'to aid in the conservation of natural-gas resources within the United States and in the orderly, equitable, and economic production, transportation, and distribution of natural gas.' s 11(a). Thus Congress was quite aware of the interests of the producing states in their natural gas supplies. [FN23] But it left the protection of ***614** those interests to measures other than the maintenance of high rates to private companies. If the Commission is to be compelled to let the stockholders of natural gas companies have a feast so that the producing states may receive crumbs from that table, the present Act must be redesigned. Such a project raises questions of policy which go beyond our province.

FN22 See P.L. 117, approved July 7, 1943, 57 Stat. 383 containing an 'Interstate Compact to Conserve Oil and Gas' between Oklahoma, Texas, New Mexico, Illinois, Colorado, and Kansas.

FN23 As we have pointed out, s 7(c) was amended by the Act of February 7, 1942, 56 Stat. 83, so as to require certificates of public convenience and necessity not only where the extensions were being made to markets in which natural gas was already being sold by another company but to other situations as well. Considerations of conservation entered into the proposal to give the Act that broader scope. H.Rep.No. 1290, 77th Cong. 1st Sess., pp. 2, 3. And see Annual Report, Federal Power Commission (1940) pp. 79, 80; Baum, The Federal Power Commission and State Utility Regulation (1942), p. 261.
The bill amending s 7(c) originally contained a subsection (h) reading as follows: 'Nothing contained in this section shall be construed to affect the authority of a State within which natural gas is produced to authorize or require the construction or extension of facilities for the transportation and sale of such gas within such State: Provided, however, That the Commission, after a hearing upon complaint or upon its own motion, may by order forbid any intrastate construction or extension by any natural-gas company which it shall find will prevent such company from rendering adequate service to its customers in interstate or foreign commerce in territory already being served.' See Hearings on H.R. 5249, House Committee on Interstate & Foreign Commerce, 77th Cong., 1st Sess., pp. 7, 11, 21, 29, 32, 33. In explanation of its deletion the House Committee Report stated, pp. 4, 5: 'The increasingly important problems raised by the desire of several States to regulate the use of the natural gas produced therein in the interest of consumers within such States, as against the Federal power to regulate interstate commerce in the interest of both interstate and intrastate consumers, are deemed by the committee to warrant further intensive study and probably a more retailed and comprehensive plan for the handling thereof than that which would have been provided by the stricken subsection.'

[20] It is hardly necessary to add that a limitation on the net earnings of a natural gas company from its interstate business is not a limitation on the power of the producing state either to safeguard its tax revenues from that industry [FN24] or to protect the interests of those who sell their gas to the interstate operator. [FN25] The return which ****294** the Commission***615** allowed was the net return after all such charges.

FN24 We have noted that in the annual operating expenses of some $16,000.000 the Commission included West Virginia and federal taxes. And in the net increase of $421,160 over 1940 operating expenses allowed by the Commission was some $80,000 for increased West Virginia property taxes. The adequacy of these amounts has not been challenged here.

FN25 The Commission included in the aggregate annual operating expenses which it allowed some $8,500,000 for gas purchased. It also allowed about $1,400,000 for natural gas production and about $600,000 for exploration and development.

It is suggested, however, that the Commission in ascertaining the cost of Hope's natural gas production plant proceeded contrary to s 1(b) which provides that the Act shall not apply to 'the production or gathering of natural gas'. But such valuation, like the provisions for operating expenses, is essential to the rate-making function as customarily performed in this country. Cf. Smith, The Control of Power Rates in the United States and England (1932), 159 The Annals 101. Indeed s 14(b) of the Act gives the Commission the power to 'determine the propriety and reasonableness of the inclusion in operating expenses, capital, or surplus of all delay rentals or other forms of rental or compensation for unoperated lands and leases.'

It is suggested that the Commission has failed to perform its duty under the Act in that it has not allowed a return for gas production that will be enough to induce private enterprise to perform completely and efficiently its functions for the public. The Commission, however, was not oblivious of those matters. It considered them. It allowed, for example, delay rentals and exploration and development costs in operating expenses. [FN26] No serious attempt has been made here to show that they are inadequate. We certainly cannot say that they are, unless we are to substitute our opinions for the expert judgment of the administrators to whom Congress entrusted the decision. Moreover, if in light of experience they turn out to be inadequate for development of new sources of supply, the doors of the Commission are open for increased allowances. This is not an order for all time. The Act contains machinery for obtaining rate adjustments. s 4.

FN26 See note 25, supra.

[21] [22] But it is said that the Commission placed too low a rate on gas for industrial purposes as compared with gas for domestic purposes and that industrial uses should be discouraged. It should be noted in the first place that the rates which the Commission has fixed are Hope's interstate wholesale rates to distributors not interstate rates to industrial users [FN27] and domestic consumers. We hardly ***616** can assume, in view of the history of the Act and its provisions, that the resales intrastate by the customer companies which distribute the gas to ultimate consumers in Ohio and Pennsylvania are subject to the rate-making powers of the Commission. [FN28] But in any event those rates are not in issue here. Moreover, we fail to find in the power to fix 'just and reasonable' rates the power to fix rates which will disallow or discourage resales for industrial use. The Committee Report stated that the Act provided 'for regulation along recognized and more or less standardized lines' and that there was 'nothing novel in its provisions'. H.Rep.No.709, supra, p. 3. Yet if we are now to tell the Commission to fix the rates so as to discourage particular uses, we would indeed be injecting into a rate case a 'novel' doctrine which has no express statutory sanction. The same would be true if we were to hold that the wasting-asset nature of the industry required the maintenance of the level of rates so that natural gas companies could make a greater profit on each unit of gas sold. Such theories of rate-making for this industry may or may not be desirable. The difficulty is that s 4(a) and s 5(a) contain only the conventional standards of rate-making for natural gas companies. [FN29] The ***617** Act of February 7, 1942, by broadening s 7 gave the Commission some additional authority to deal with the conservation aspects of the problem. [FN30] But s 4(a) and s 5(a) were not changed. If the standard****295** of 'just and reasonable' is to sanction the maintenance of high rates by a natural gas company because they restrict the use of natural gas for certain purposes, the Act must be further amended.

FN27 The Commission has expressed doubts over its power to fix rates on 'direct sales to industries' from interstate pipelines as distinguished from 'sales for resale to the industrial customers of distributing companies.' Annual Report, Federal Power Commission (1940), p. 11.

FN28. Sec. 1(b) of the Act provides: 'The provisions of this Act shall apply to the transportation of natural gas in interstate commerce, to the sale in interstate commerce of natural gas for resale for ultimate public consumption for domestic, commercial, industrial, or any other use, and to natural-gas companies engaged in such transportation or sale, but shall not apply to any other transportation or sale of natural gas or to the local distribution of natural gas or to the facilities used for such distribution or to the production or gathering of natural gas.' And see s 2(6), defining a 'natural-gas company', and H.Rep.No. 709, supra, pp. 2, 3.

FN29 The wasting-asset characteristic of the industry was recognized prior to the Act as requiring the inclusion of a depletion allowance among operating expenses. See Columbus Gas & Fuel Co. v. Public Utilities Commission, 292 U.S. 398, 404, 405, 54 S.Ct. 763, 766, 767, 78 L.Ed. 1327, 91 A.L.R. 1403. But no such theory of rate-making for natural gas companies as is now suggested emerged from the cases arising during the earlier period of regulation.

FN30 The Commission has been alert to the problems of conservation in its administration of the Act. It has indeed suggested that it might be wise to restrict the use of natural gas 'by functions rather than by areas.' Annual Report (1940) p. 79.

The Commission stated in that connection that natural gas was particularly adapted to certain industrial uses. But it added that the general use of such gas 'under boilers for the production of steam' is 'under most circumstances of very questionable social economy.' Ibid.

[23] [24] It is finally suggested that the rates charged by Hope are discriminatory as against domestic users and in favor of industrial users. That charge is apparently based on s 4(b) of the Act which forbids natural gas companies from maintaining 'any unreasonable difference in rates, charges, service, facilities, or in any other respect, either as between localities or as between classes of service.' The power of the Commission to eliminate any such unreasonable differences or discriminations is plain. s 5(a). The Commission, however, made no findings under s 4(b). Its failure in that regard was not challenged in the petition to review. And it has not been raised or argued here by any party. Hence the problem of discrimination has no proper place in the present decision. It will be time enough to pass on that issue when it is presented to us. Congress has entrusted the administration of the Act to the Commission not to the courts. Apart from the requirements of judicial review it is not ***618** for us to advise the Commission how to discharge its functions.

Findings as to the Lawfulness of Past Rates. As we have noted, the Commission made certain findings as to the lawfulness of past rates which Hope had charged its interstate customers. Those findings were made on the complaint of the City of Cleveland and in aid of state regulation. It is conceded that under the Act the Commission has no power to make reparation orders. And its power to fix rates admittedly is limited to those 'to be thereafter observed and in force.' s 5(a). But the Commission maintains that it has the power to make findings as to the lawfulness of past rates even though it has no power to fix those rates. [FN31] However that may be, we do not think that these findings were reviewable under s 19(b) of the Act. That section gives any party 'aggrieved by an order' of the Commission a review 'of such order' in the circuit court of appeals for the circuit where the natural gas company is located or has its principal place of business or in the United States Court of Appeals for the District of Columbia. We do not think that the findings in question fall within that category.

FN31 The argument is that s 4(a) makes 'unlawful' the charging of any rate that is not just and reasonable. And s 14(a) gives the Commission power to investigate any matter 'which it may find necessary or proper in order to determine whether any person has violated' any provision of the Act. Moreover, s 5(b) gives the Commission power to investigate and determine the cost of production or transportation of natural gas in cases where it has 'no authority to establish a rate governing the transportation or sale of such natural gas.' And s 17(c) directs the Commission to 'make available to the several State commissions such information and reports as may be of assistance in State regulation of natural-gas companies.' For a discussion of these points by the Commission see 44 P.U.R.,N.S., at pages 34, 35.

[25] [26] The Court recently summarized the various types of administrative action or determination reviewable as orders under the Urgent Deficiencies Act of October 22, ***619** 1913, 28 U.S.C. ss 45, 47a, 28 U.S.C.A. ss 45, 47a, and kindred statutory provisions. Rochester Tel. Corp. v. United States, 307 U.S. 125, 59 S.Ct. 754, 83 L.Ed. 1147. It was there pointed out that where 'the order sought to be reviewed does not of itself adversely affect complainant but only affects his rights adversely on the contingency of future administrative action', it is not

reviewable. Id., 307 U.S. at page 130, 59 S.Ct. at page 757, 83 L.Ed. 1147. The Court said, 'In view of traditional conceptions of federal judicial power, resort to the courts in these situations is either premature or wholly beyond their province.' ****296**Id., 307 U.S. at page 130, 59 S.Ct. at page 757, 83 L.Ed. 1147. And see United States v. Los Angeles s.l.r. c/o., 273 U.S. 299, 309, 310, 47 S.Ct. 413, 414, 415, 71 L.Ed. 651; Shannahan v. United States, 303 U.S. 596, 58 S.Ct. 732, 82 L.Ed. 1039. These considerations are apposite here. The Commission has no authority to enforce these findings. They are 'the exercise solely of the function of investigation.' United States v. Los Angeles & S.L.R. Co., supra, 273 U.S. at page 310, 47 S.Ct. at page 414, 71 L.Ed. 651. They are only a preliminary, interim step towards possible future action-action not by the Commission but by wholly independent agencies. The outcome of those proceedings may turn on factors other than these findings. These findings may never result in the respondent feeling the pinch of administrative action.

Reversed.

Mr. Justice ROBERTS took no part in the consideration or decision of this case.

Opinion of Mr. Justice BLACK and Mr. Justice MURPHY.

We agree with the Court's opinion and would add nothing to what has been said but for what is patently a wholly gratuitous assertion as to Constitutional law in the dissent of Mr. Justice FRANKFURTER. We refer to the statement that 'Congressional acquiescence to date in the doctrine of Chicago, etc., R. Co. v. Minnesota, supra (134 U.S. 418, 10 S.Ct. 462, 702, 33 L.Ed. 970), may fairly be claimed.' That was the case in which a majority of this Court was finally induced to expand the meaning ***620** of 'due process' so as to give courts power to block efforts of the state and national governments to regulate economic affairs. The present case does not afford a proper occasion to discuss the soundness of that doctrine because, as stated in Mr. Justice FRANKFURTER'S dissent, 'That issue is not here in controversy.' The salutary practice whereby courts do not discuss issues in the abstract applies with peculiar force to Constitutional questions. Since, however, the dissent adverts to a highly controversial due process doctrine and implies its acceptance by Congress, we feel compelled to say that we do not understand that Congress voluntarily has acquiesced in a Constitutional principle of government that courts, rather than legislative bodies, possess final authority over regulation of economic affairs. Even this Court has not always fully embraced that principle, and we wish to repeat that we have never acquiesced in it, and do not now. See Federal Power Commission v. Natural Gas Pipeline Co., 315 U.S. 575, 599-601, 62 S.Ct. 736, 749, 750, 86 L.Ed. 1037.

Mr. Justice REED, dissenting.

This case involves the problem of rate making under the Natural Gas Act. Added importance arises from the obvious fact that the principles stated are generally applicable to all federal agencies which are entrusted with the determination of rates for utilities. Because my views differ somewhat from those of my brethren, it may be of some value to set them out in a summary form.

The Congress may fix utility rates in situations subject to federal control without regard to any standard except the constitutional standards of due process and for taking private property for public use without just compensation. Wilson v. New, 243 U.S. 332, 350, 37 S.Ct. 298, 302, 61 L.Ed. 755, L.R.A.1917E, 938, Ann.Cas.1918A, 1024. A Commission, however, does not have this freedom of action. Its powers are limited not only by the constitutional standards but also by the standards of the delegation. Here the standard added by the Natural Gas Act is that the rate be 'just ***621** and reasonable.' [FN1] Section 6 [FN2] ****297** throws additional light on the meaning of these words.

FN1 Natural Gas Act, s 4(a), 52 Stat. 821, 822, 15 U.S.C. s 717c(a), 15 U.S.C.A. s 717c(a).

FN2 52 Stat. 821, 824, 15 U.S.C. s 717e, 15 U.S.C.A. s 717e:

'(a) The Commission may investigate and ascertain the actual legitimate cost of the property of every natural-gas company, the depreciation therein, and, when found necessary for rate-making purposes, other facts which bear on the determination of such cost or depreciation and the fair value of such property.

'(b) Every natural-gas company upon request shall file with the Commission an inventory of all or any part of its property and a statement of the original cost thereof, and shall keep the Commission informed regarding the cost of all additions, betterments, extensions, and new construction.'

When the phrase was used by Congress to describe allowable rates, it had relation to something ascertainable. The rates were not left to the whim of the Commission. The rates fixed would produce an annual return and that annual return was to be compared with a theoretical just and reasonable return, all risks considered, on the fair value of the property used and useful in the public service at the time of the determination.

Such an abstract test is not precise. The agency charged

with its determination has a wide range before it could properly be said by a court that the agency had disregarded statutory standards or had confiscated the property of the utility for public use. Cf. Chicago, M. & St. P.R. Co. v. Minnesota, 134 U.S. 418, 461-466, 10 S.Ct. 462, 702, 703-705, 33 L.Ed. 970, dissent. This is as Congress intends. Rates are left to an experienced agency particularly competent by training to appraise the amount required.

The decision as to a reasonable return had not been a source of great difficulty, for borrowers and lenders reached such agreements daily in a multitude of situations; and although the determination of fair value had been troublesome, its essentials had been worked out in fairness to investor and consumer by the time of the enactment***622** of this Act. Cf. Los Angeles G. & E. Corp. v. Railroad Comm., 289 U.S. 287, 304 et seq., 53 S.Ct. 637, 643 et seq., 77 L.Ed. 1180. The results were well known to Congress and had that body desired to depart from the traditional concepts of fair value and earnings, it would have stated its intention plainly. Helvering v. Griffiths, 318 U.S. 371, 63 S.Ct. 636.

It was already clear that when rates are in dispute, 'earnings produced by rates do not afford a standard for decision.' 289 U.S. at page 305, 53 S.Ct. at page 644, 77 L.Ed. 1180. Historical cost, prudent investment and reproduction cost [FN3] were all relevant factors in determining fair value. Indeed, disregarding the pioneer investor's risk, if prudent investment and reproduction cost were not distorted by changes in price levels or technology, each of them would produce the same result. The realization from the risk of an investment in a speculative field, such as natural gas utilities, should be reflected in the present fair value. [FN4] The amount of evidence to be admitted on any point was of course in the agency's reasonable discretion, and it was free to give its own weight to these or other factors and to determine from all the evidence its own judgment as to the necessary rates.

FN3 'Reproduction cost' has been variously defined, but for rate making purposes the most useful sense seems to be, the minimum amount necessary to create at the time of the inquiry a modern plant capable of rendering equivalent service. See I Bonbright, Valuation of Property (1937) 152. Reproduction cost as the cost of building a replica of an obsolescent plant is not of real significance.

'Prudent investment' is not defined by the Court. It may mean the sum originally put in the enterprise, either with or without additional amounts from excess earnings reinvested in the business.

FN4 It is of no more than bookkeeping significance whether the Commission allows a rate of return commensurate with the risk of the original investment or the lower rate based on current risk and a capitalization reflecting the established earning power of a successful company and the probable cost of duplicating its services. Cf. American T. & T. Co. v. United States, 299 U.S. 232, 57 S.Ct. 170, 81 L.Ed. 142. But the latter is the traditional method.

***623** I agree with the Court in not imposing a rule of prudent investment alone in determining the rate base. This leaves the Commission free, as I understand it, to use any available evidence for its finding of fair value, including both prudent investment and the cost of installing at the present time an efficient system for furnishing the needed utility service.

My disagreement with the Court arises primarily from its view that it makes no ****298** difference how the Commission reached the rate fixed so long as the result is fair and reasonable. For me the statutory command to the Commission is more explicit. Entirely aside from the constitutional problem of whether the Congress could validly delegate its rate making power to the Commission, in toto and without standards, it did legislate in the light of the relation of fair and reasonable to fair value and reasonable return. The Commission must therefore make its findings in observance of that relationship.

The Federal Power Commission did not, as I construe their action, disregard its statutory duty. They heard the evidence relating to historical and reproduction cost and to the reasonable rate of return and they appraised its weight. The evidence of reproduction cost was rejected as unpersuasive, but from the other evidence they found a rate base, which is to me a determination of fair value. On that base the earnings allowed seem fair and reasonable. So far as the Commission went in appraising the property employed in the service, I find nothing in the result which indicates confiscation, unfairness or unreasonableness. Good administration of rate making agencies under this method would avoid undue delay and render revaluations unnecessary except after violent fluctuations of price levels. Rate making under this method has been subjected to criticism. But until Congress changes the standards for the agencies, these rate making bodies should continue the conventional theory of rate ***624** making. It will probably be simpler to improve present methods than to devise new ones.

But a major error, I think was committed in the disregard

by the Commission of the investment in exploratory operations and other recognized capital costs. These were not considered by the Commission because they were charged to operating expenses by the company at a time when it was unregulated. Congress did not direct the Commission in rate making to deduct from the rate base capital investment which had been recovered during the unregulated period through excess earnings. In my view this part of the investment should no more have been disregarded in the rate base than any other capital investment which previously had been recovered and paid out in dividends or placed to surplus. Even if prudent investment throughout the life of the property is accepted as the formula for figuring the rate base, it seems to me illogical to throw out the admittedly prudent cost of part of the property because the earnings in the unregulated period had been sufficient to return the prudent cost to the investors over and above a reasonable return. What would the answer be under the theory of the Commission and the Court, if the only prudent investment in this utility had been the seventeen million capital charges which are now disallowed?

For the reasons heretofore stated, I should affirm the action of the Circuit Court of Appeals in returning the proceeding to the Commission for further consideration and should direct the Commission to accept the disallowed capital investment in determining the fair value for rate making purposes.

Mr. Justice FRANKFURTER, dissenting.
My brother JACKSON has analyzed with particularity the economic and social aspects of natural gas as well as ***625** the difficulties which led to the enactment of the Natural Gas Act, especially those arising out of the abortive attempts of States to regulate natural gas utilities. The Natural Gas Act of 1938 should receive application in the light of this analysis, and Mr. Justice JACKSON has, I believe, drawn relevant inferences regarding the duty of the Federal Power Commission in fixing natural gas rates. His exposition seems to me unanswered, and I shall say only a few words to emphasize my basic agreement with him.

For our society the needs that are met by public utilities are as truly public services as the traditional governmental functions of police and justice. They are not less so when these services are rendered by private enterprise under governmental regulation. Who ultimately determines the ways of regulation, is the decisive aspect in the public supervision of privately-owned utilities. Foreshadowed nearly sixty years ago, Railroad Commission Cases (Stone v. Farmers' Loan & Trust Co.), 116 U.S. 307, 331, 6 S.Ct. 334, 344, 388, 1191, 29 L.Ed. 636, it was decided more than fifty ****299** years ago that the final say under the Constitution lies with the judiciary and not the legislature. Chicago, etc., R. Co. v. Minnesota , 134 U.S. 418, 10 S.Ct. 462, 702, 33 L.Ed. 970.

While legal issues touching the proper distribution of governmental powers under the Constitution may always be raised, Congressional acquiescence to date in the doctrine of Chicago, etc., R. Co. v. Minnesota, supra, may fairly be claimed. But in any event that issue is not here in controversy. As pointed out in the opinions of my brethren, Congress has given only limited authority to the Federal Power Commission and made the exercise of that authority subject to judicial review. The Commission is authorized to fix rates chargeable for natural gas. But the rates that it can fix must be 'just and reasonable'. s 5 of the Natural Gas Act, 15 U.S.C. s 717d, 15 U.S.C.A. s 717d. Instead of making the Commission's rate determinations final, Congress***626** specifically provided for court review of such orders. To be sure, 'the finding of the Commission as to the facts, if supported by substantial evidence' was made 'conclusive', s 19 of the Act, 15 U.S.C. s 717r; 15 U.S.C.A. s 717r. But obedience of the requirement of Congress that rates be 'just and reasonable' is not an issue of fact of which the Commission's own determination is conclusive. Otherwise, there would be nothing for a court to review except questions of compliance with the procedural provisions of the Natural Gas Act. Congress might have seen fit so to cast its legislation. But it has not done so. It has committed to the administration of the Federal Power Commission the duty of applying standards of fair dealing and of reasonableness relevant to the purposes expressed by the Natural Gas Act. The requirement that rates must be 'just and reasonable' means just and reasonable in relation to appropriate standards. Otherwise Congress would have directed the Commission to fix such rates as in the judgment of the Commission are just and reasonable; it would not have also provided that such determinations by the Commission are subject to court review.

To what sources then are the Commission and the courts to go for ascertaining the standards relevant to the regulation of natural gas rates? It is at this point that Mr. Justice JACKSON'S analysis seems to me pertinent. There appear to be two alternatives. Either the fixing of natural gas rates must be left to the unguided discretion of the Commission so long as the rates it fixes do not reveal a glaringly had prophecy of the ability of a regulated utility to continue its service in the future. Or the Commission's rate orders must be founded on due consideration of all the elements of the public interest which the production and distribution of natural gas involve just because it is natural gas. These elements are reflected in the Natural Gas Act, if that Act be applied as

an entirety. See, for ***627** instance, ss 4(a)(b)(c)(d), 6, and 11, 15 U.S.C. ss 717c(a)(b)(c)(d), 717e, and 717j, 15 U.S.C.A. ss 717c(a-d), 717e, 717j. Of course the statute is not concerned with abstract theories of ratemaking. But its very foundation is the 'public interest', and the public interest is a texture of multiple strands. It includes more than contemporary investors and contemporary consumers. The needs to be served are not restricted to immediacy, and social as well as economic costs must be counted.

It will not do to say that it must all be left to the skill of experts. Expertise is a rational process and a rational process implies expressed reasons for judgment. It will little advance the public interest to substitute for the hodge-podge of the rule in Smyth v. Ames, 169 U.S. 466, 18 S.Ct. 418, 42 L.Ed. 819, an encouragement of conscious obscurity or confusion in reaching a result, on the assumption that so long as the result appears harmless its basis is irrelevant. That may be an appropriate attitude when state action is challenged as unconstitutional. Cf. Driscoll v. Edison Light & Power Co., 307 U.S. 104, 59 S.Ct. 715, 83 L.Ed. 1134. But it is not to be assumed that it was the design of Congress to make the accommodation of the conflicting interests exposed in Mr. Justice JACKSON'S opinion the occasion for a blind clash of forces or a partial assessment of relevant factors, either before the Commission or here.

The objection to the Commission's action is not that the rates it granted were too low but that the range of its vision was too narrow. And since the issues before the Commission involved no less than the ****300** total public interest, the proceedings before it should not be judged by narrow conceptions of common law pleading. And so I conclude that the case should be returned to the Commission. In order to enable this Court to discharge its duty of reviewing the Commission's order, the Commission should set forth with explicitness the criteria by which it is guided ***628** in determining that rates are 'just and reasonable', and it should determine the public interest that is in its keeping in the perspective of the considerations set forth by Mr. Justice JACKSON.

By Mr. Justice JACKSON.

Certainly the theory of the court below that ties rate-making to the fair-value-reproduction-cost formula should be overruled as in conflict with Federal Power Commission v. Natural Gas Pipeline Co. [FN1] But the case should, I think, be the occasion for reconsideration of our rate-making doctrine as applied to natural gas and should be returned to the Commission for further consideration in the light thereof.

FN1 315 U.S. 575, 62 S.Ct. 736, 86 L.Ed. 1037.

The Commission appears to have understood the effect of the two opinions in the Pipeline case to be at least authority and perhaps direction to fix natural gas rates by exclusive application of the 'prudent investment' rate base theory. This has no warrant in the opinion of the Chief Justice for the Court, however, which released the Commission from subservience to 'any single formula or combination of formulas' provided its order, 'viewed in its entirety, produces no arbitrary result.' 315 U.S. at page 586, 62 S.Ct. at page 743, 86 L.Ed. 1037. The minority opinion I understood to advocate the 'prudent investment' theory as a sufficient guide in a natural gas case. The view was expressed in the court below that since this opinion was not expressly controverted it must have been approved. [FN2] I disclaim this imputed***629** approval with some particularity, because I attach importance at the very beginning of federal regulation of the natural gas industry to approaching it as the performance of economic functions, not as the performance of legalistic rituals.

FN2 Judge Dobie, dissenting below, pointed out that the majority opinion in the Pipeline case 'contains no express discussion of the Prudent Investment Theory' and that the concurring opinion contained a clear one, and said, 'It is difficult for me to believe that the majority of the Supreme Court, believing otherwise, would leave such a statement unchallenged.' (134 F.2d 287, 312.) The fact that two other Justices had as matter of record in our books long opposed the reproduction cost theory of rate bases and had commented favorably on the prudent investment theory may have influenced that conclusion. See opinion of Mr. Justice Frankfurter in Driscoll v. Edison Light & Power Co., 307 U.S. 104, 122, 59 S.Ct. 715, 724, 83 L.Ed. 1134, and my brief as Solicitor General in that case. It should be noted, however, that these statements were made, not in a natural gas case, but in an electric power case-a very important distinction, as I shall try to make plain.

I.

Solutions of these cases must consider eccentricities of the industry which gives rise to them and also to the Act of Congress by which they are governed.

The heart of this problem is the elusive, exhaustible, and irreplaceable nature of natural gas itself. Given sufficient money, we can produce any desired amount of railroad,

bus, or steamship transportation, or communications facilities, or capacity for generation of electric energy, or for the manufacture of gas of a kind. In the service of such utilities one customer has little concern with the amount taken by another, one's waste will not deprive another, a volume of service and be created equal to demand, and today's demands will not exhaust or lessen capacity to serve tomorrow. But the wealth of Midas and the wit of man cannot produce or reproduce a natural gas field. We cannot even reproduce the gas, for our manufactured product has only about half the heating value per unit of nature's own. FN3

FN3 Natural gas from the Appalachian field averages about 1050 to 1150 B.T.U. content, while by-product manufactured gas is about 530 to 540. Moody's Manual of Public Utilities (1943) 1350; Youngberg, Natural Gas (1930) 7.

****301** Natural gas in some quantity is produced in twenty-four states. It is consumed in only thirty-five states, and is ***630** available only to about 7,600,000 consumers. FN4 Its availability has been more localized than that of any other utility service because it has depended more on the caprice of nature.

FN4 Sen.Rep. No. 1162, 75th Cong., 1st Sess., 2.

The supply of the Hope Company is drawn from that old and rich and vanishing field that flanks the Appalachian mountains. Its center of production is Pennsylvania and West Virginia, with a fringe of lesser production in New York, Ohio, Kentucky, Tennessee, and the north end of Alabama. Oil was discovered in commercial quantities at a depth of only 69 1/2 feet near Titusville, Pennsylvania, in 1859. Its value then was about $16 per barrel. FN5 The oil branch of the petroleum industry went forward at once, and with unprecedented speed. The area productive of oil and gas was roughed out by the drilling of over 19,000 'wildcat' wells, estimated to have cost over $222,000,000. Of these, over 18,000 or 94.9 per cent, were 'dry holes.' About five per cent, or 990 wells, made discoveries of commercial importance, 767 of them resulting chiefly in oil and 223 in gas only. FN6 Prospecting for many years was a search for oil, and to strike gas was a misfortune. Waste during this period and even later is appalling. Gas was regarded as having no commercial value until about 1882, in which year the total yield was valued only at about $75,000. FN7 Since then, contrary to oil, which has become cheaper gas in this field has pretty steadily advanced in price.

FN5 Arnold and Kemnitzer, Petroleum in the United States and Possessions (1931) 78.

FN6. Id. at 62-63.

FN7. Id. at 61.

While for many years natural gas had been distributed on a small scale for lighting, FN8 its acceptance was slow, ***631** facilities for its utilization were primitive, and not until 1885 did it take on the appearance of a substantial industry. FN9 Soon monopoly of production or markets developed. FN10 To get gas from the mountain country, where it was largely found, to centers of population, where it was in demand, required very large investment. By ownership of such facilities a few corporate systems, each including several companies, controlled access to markets. Their purchases became the dominating factor in giving a market value to gas produced by many small operators. Hope is the market for over 300 such operators. By 1928 natural gas in the Appalachian field commanded an average price of 21.1 cents per m.c.f. at points of production and was bringing 45.7 cents at points of consumption. FN11 The companies which controlled markets, however, did not rely on gas purchases alone. They acquired and held in fee or leasehold great acreage in territory proved by 'wildcat' drilling. These large marketing system companies as well as many small independent owners and operators have carried on the commercial development of proved territory. The development risks appear from the estimate that up to 1928, 312,318 proved area wells had been sunk in the Appalachian field of which 48,962, or 15.7 per cent, failed to produce oil or gas in commercial quantity. FN12

FN8 At Fredonia, New York, in 1821, natural gas was conveyed from a shallow well to some thirty people. The lighthouse at Barcelona Harbor, near what is now Westfield, New York, was at about that time and for many years afterward lighted by gas that issued from a crevice. Report on Utility Corporations by Federal Trade Commission, Sen.Doc. 92, Pt. 84-A, 70th Cong., 1st Sess., 8-9.

FN9 In that year Pennsylvania enacted 'An Act to provide for the incorporation and regulation of natural gas companies.' Penn.Laws 1885, No. 32, 15 P.S. s 1981 et seq.

FN10 See Steptoe and Hoffheimer's Memorandum for Governor Cornwell of West Virginia (1917) 25 West Virginia Law Quarterly 257; see also Report on Utility Corporations by

(Cite as: 51 P.U.R.(NS) 193, 64 S.Ct. 281)

Federal Trade Commission, Sen.Doc. No. 92, Pt. 84-A, 70th Cong., 1st Sess.

FN11 Arnold and Kemnitzer, Petroleum in the United States and Possessions (1931) 73.

FN12. Id. at 63.

***632** With the source of supply thus tapped to serve centers of large demand, like Pittsburgh, Buffalo, Cleveland, Youngstown, Akron, and other industrial communities, the distribution of natural gas fast became big business. Its advantages as a ****302** fuel and its price commended it, and the business yielded a handsome return. All was merry and the goose hung high for consumers and gas companies alike until about the time of the first. World War. Almost unnoticed by the consuming public, the whole Appalachian field passed its peak of production and started to decline. Pennsylvania, which to 1928 had given off about 38 per cent of the natural gas from this field, had its peak in 1905; Ohio, which had produced 14 per cent, had its peak in 1915; and West Virginia, greatest producer of all, with 45 per cent to its credit, reached its peak in 1917. FN13

FN13. Id. at 64.

Western New York and Eastern Ohio, on the fringe of the field, had some production but relied heavily on imports from Pennsylvania and West Virginia. Pennsylvania, a producing and exporting state, was a heavy consumer and supplemented her production with imports from West Virginia. West Virginia was a consuming state, but the lion's share of her production was exported. Thus the interest of the states in the North Appalachian supply was in conflict.

Competition among localities to share in the failing supply and the helplessness of state and local authorities in the presence of state lines and corporate complexities is a part of the background of federal intervention in the industry. FN14 West Virginia took the boldest measure. It legislated a priority in its entire production in favor of its own inhabitants. That was frustrated by an injunction***633** from this Court. FN15 Throughout the region clashes in the courts and conflicting decisions evidenced public anxiety and confusion. It was held that the New York Public Service Commission did not have power to classify consumers and restrict their use of gas. FN16 That Commission held that a company could not abandon a part of its territory and still serve the rest. FN17 Some courts admonished the companies to take action to protect consumers. FN18 Several courts held that companies, regardless of failing supply, must continue to take on customers, but such compulsory additions were finally held to be within the Public Service Commission's discretion. FN19 There were attempts to throw up franchises and quit the service, and municipalities resorted to the courts with conflicting results. FN20 Public service commissions of consuming states were handicapped, for they had no control of the supply. FN21

FN14 See Report on Utility Corporations by Federal Trade Commission, Sen.Doc. No. 92, Pt. 84-A, 70th Cong., 1st Sess.

FN15 Commonwealth of Pennsylvania v. West Virginia, 262 U.S. 553, 43 S.Ct. 658, 67 L.Ed. 1117, 32 A.L.R. 300. For conditions there which provoked this legislation, see 25 West Virginia Law Quarterly 257.

FN16 People ex rel. Pavilion Natural Gas Co. v. Public Service Commission, 188 App.Div. 36, 176 N.Y.S. 163.

FN17 Village of Falconer v. Pennsylvania Gas Company, 17 State Department Reports, N.Y., 407.

FN18 See, for example, Public Service Commission v. Iroquois Natural Gas Co., 108 Misc. 696, 178 N.Y.S. 24; Park Abbott Realty Co. v. Iroquois Natural Gas Co., 102 Misc. 266, 168 N.Y.S. 673; Public Service Commission v. Iroquois Natural Gas Co., 189 App.Div. 545, 179 N.Y.S. 230.

FN19 People ex rel. Pennsylvania Gas Co. v. Public Service Commission, 196 App.Div. 514, 189 N.Y.S. 478.

FN20 East Ohio Gas Co. v. Akron, 81 Ohio St. 33, 90 N.E. 40, 26 L.R.A., N.S., 92, 18 Ann.Cas. 332; Village of New-comerstown v. Consolidated Gas Co., 100 Ohio St. 494, 127 N.E. 414; Gress v. Village of Ft. Laramie, 100 Ohio St. 35, 125 N.E. 112, 8 A.L.R. 242; City of Jamestown v. Pennsylvania Gas Co., D.C., 263 F. 437; Id., D.C., 264 F. 1009. See, also, United Fuel Gas Co. v. Railroad Commission, 278 U.S. 300, 308, 49 S.Ct. 150, 152, 73 L.Ed. 390.

FN21 The New York Public Service Commission said: 'While the transportation of natural gas through pipe lines from one state to another state is interstate commerce * * *, Congress has not taken over the regulation of

that particular industry. Indeed, it has expressly excepted it from the operation of the Interstate Commerce Commissions Law (Interstate Commerce Commissions Law, section 1). It is quite clear, therefore, that this Commission can not require a Pennsylvania corporation producing gas in Pennsylvania to transport it and deliver it in the State of New York, and that the Interstate Commerce Commission is likewise powerless. If there exists such a power, and it seems that there does, it is a power vested in Congress and by it not yet exercised. There is no available source of supply for the Crystal City Company at present except through purchasing from the Porter Gas Company. It is possible that this Commission might fix a price at which the Potter Gas Company should sell if it sold at all, but as the Commission can not require it to supply gas in the State of New York, the exercise of such a power to fix the price, if such power exists, would merely say, sell at this price or keep out of the State.' Lane v. Crystal City Gas Co., 8 New York Public Service Comm.Reports, Second District, 210, 212.

****303 *634** Shortages during World War I occasioned the first intervention in the natural gas industry by the Federal Government. Under Proclamation of President Wilson the United States Fuel Administrator took control, stopped extensions, classified consumers and established a priority for domestic over industrial use. FN22 After the war federal control was abandoned. Some cities once served with natural gas became dependent upon mixed gas of reduced heating value and relatively higher price. FN23

FN22 Proclamation by the President of September 16, 1918; Rules and Regulations of H. A. Garfield, Fuel Administrator, September 24, 1918.

FN23 For example, the Iroquois Gas Corporation which formerly served Buffalo, New York, with natural gas ranging from 1050 to 1150 b.t.u. per cu. ft., now mixes a by-product gas of between 530 and 540 b.t.u. in proportions to provide a mixed gas of about 900 b.t.u. per cu. ft. For space heating or water heating its charges range from 65 cents for the first m.c.f. per month to 55 cents for all above 25 m.c.f. per month. Moody's Manual of Public Utilities (1943) 1350.

Utilization of natural gas of highest social as well as economic return is domestic use for cooking and water ***635** heating, followed closely by use for space heating in homes. This is the true public utility aspect of the enterprise, and its preservation should be the first concern of regulation. Gas does the family cooking cheaper than any other fuel. FN24 But its advantages do not end with dollars and cents cost. It is delivered without interruption at the meter as needed and is paid for after it is used. No money is tied up in a supply, and no space is used for storage. It requires no handling, creates no dust, and leaves no ash. It responds to thermostatic control. It ignites easily and immediately develops its maximum heating capacity. These incidental advantages make domestic life more liveable.

FN24 The United States Fuel Administration made the following cooking value comparisons, based on tests made in the Department of Home Economics of Ohio State University:
Natural gas at 1.12 per M. is equivalent to coal at $6.50 per ton.
Natural gas at 2.00 per M. is equivalent to gasoline at 27¢ per gal.
Natural gas at 2.20 per M. is equivalent to electricity at 3¢ per k.w.h.
Natural gas at 2.40 per M. is equivalent to coal oil at 15¢ per gal.
Use and Conservation of Natural Gas, issued by U.S. Fuel Administration (1918) 5.

Industrial use is induced less by these qualities than by low cost in competition with other fuels. Of the gas exported from West Virginia by the Hope Company a very substantial part is used by industries. This wholesale use speeds exhaustion of supply and displaces other fuels. Coal miners and the coal industry, a large part of whose costs are wages, have complained of unfair competition from low-priced industrial gas produced with relatively little labor cost. FN25

FN25 See Brief on Behalf jof Legislation Imposing an Excise Tax on Natural Gas, submitted to N.R.A. by the United Mine Workers of America and the National Coal Association.

Gas rate structures generally have favored industrial users. In 1932, in Ohio, the average yield on gas for domestic consumption was 62.1 cents per m.c.f. and on industrial,***636** 38.7. In Pennsylvania, the figures were 62.9 against 31.7. West Virginia showed the least spread, domestic consumers paying 36.6 cents; and industrial, 27.7. FN26 Although this spread is less than ****304** in other parts of the United States, FN27 it can hardly be said to be

self-justifying. It certainly is a very great factor in hastening decline of the natural gas supply.

FN26 Brief of National Gas Association and United Mine Workers, supra, note 26, pp. 35, 36, compiled from Bureau of Mines Reports.

FN27 From the source quoted in the preceding note the spread elsewhere is shown to be:

State.	Industrial	Domestic
Illinois.	29.2	1.678
Louisiana.	10.4	59.7
Oklahoma.	11.2	41.5
Texas.	13.1	59.7
Alabama.	17.8	1.227
Georgia.	22.9	1.043

About the time of World War I there were occasional and short-lived efforts by some hard-pressed companies to reverse this discrimination and adopt graduated rates, giving a low rate to quantities adequate for domestic use and graduating it upward to discourage industrial use. FN28 ***637** These rates met opposition from industrial sources, of course, and since diminished revenues from industrial sources tended to increase the domestic price, they met little popular or commission favor. The fact is that neither the gas companies nor the consumers nor local regulatory bodies can be depended upon to conserve gas. Unless federal regulation will take account of conservation, its efforts seem, as in this case, actually to constitute a new threat to the life of the Appalachian supply.

FN28 In Corning, New York, rates were initiated by the Crystal City Gas Company as follows: 70¢ for the first 5,000 cu. ft. per month; 80¢ from 5,000 to 12,000; $1 for all over 12,000. The Public Service Commission rejected these rates and fixed a flat rate of 58¢ per m.c.f. Lane v. Crystal City Gas Co., 8 New York Public Service Comm. Reports, Second District, 210.
The Pennsylvania Gas Company (National Fuel Gas Company group) also attempted a sliding scale rate for New York consumers, net per month as follows: First 5,000 feet, 35¢ ; second 5,000 feet, 45¢ ; third 5,000 feet, 50¢ ; all above 15,000, 55¢ . This was eventually abandoned, however. The company's present scale in Pennsylvania appears to be reversed to the following net monthly rate; first 3 m.c.f., 75¢ ; next 4 m.c.f., 60¢ ; next 8 m.c.f., 55¢ ; over 15 m.c.f., 50¢ . Moody's Manual of Public Utilities (1943) 1350. In New York it now serves a mixed gas.
For a study of effect of sliding scale rates in reducing consumption see 11 Proceedings of Natural Gas Association of America (1919) 287.

II.

Congress in 1938 decided upon federal regulation of the industry. It did so after an exhaustive investigation of all aspects including failing supply and competition for the use of natural gas intensified by growing scarcity. FN29 Pipelines from the Appalachian area to markets were in the control of a handful of holding company systems. FN30 This created a highly concentrated control of the producers' market and of the consumers' supplies. While holding companies dominated both production and distribution they segregated those activities in separate ***638** subsidiaries, FN31 the effect of which, if not the purpose, was to isolate ****305** some end of the business from the reach of any one state commission. The cost of natural gas to consumers moved steadily upwards over the years, out of proportion to prices of oil, which, except for the element of competition, is produced under somewhat comparable conditions. The public came to feel that the companies were exploiting the growing scarcity of local gas. The problems of this region had much to do with creating the demand for federal regulation.

FN29 See Report on Utility Corporations by Federal Trade Commission, Sen. Doc. 92, Pt. 84-A, 70th Cong., 1st Sess.

FN30 Four holding company systems control over 55 per cent of all natural gas transmission lines in the United States. They are Columbia Gas and Electric Corporation, Cities Service Co., Electric Bond and Share Co., and Standard Oil Co. of New Jersey. Columbia alone controls nearly 25 per cent, and fifteen companies account for over 80 per cent of the total. Report on Utility Corporations by Federal Trade Commission, Sen. Doc. 92, Pt. 84-A, 70th Cong., 1st Sess., 28.
In 1915, so it was reported to the Governor of West

Virginia, 87 per cent of the total gas production of that state was under control of eight companies. Steptoe and Hoffheimer, Legislative Regulation of Natural Gas Supply in West Virginia, 17 West Virginia Law Quarterly 257, 260. Of these, three were subsidiaries of the Columbia system and others were subsidiaries of larger systems. In view of inter-system sales and interlocking interests it may be doubted whether there is much real competition among these companies.

FN31 This pattern with its effects on local regulatory efforts will be observed in our decisions. See United Fuel Gas Co. v. Railroad Commission, 278 U.S. 300, 49 S.Ct. 150, 73 L.Ed. 390; United Fuel Gas Co. v. Public Service Commission, 278 U.S. 322, 49 S.Ct. 157, 73 L.Ed. 402; Dayton Power & Light v. Public Utilities Commission, 292 U.S. 290, 54 S.Ct. 647, 78 L.Ed. 1267; Columbus Gas & Fuel Co. v. Public Utilities Commission, 292 U.S. 398, 54 S.Ct. 763, 78 L.Ed. 1327, 91 A.L.R. 1403, and the present case.

The Natural Gas Act declared the natural gas business to be 'affected with a public interest,' and its regulation 'necessary in the public interest.' FN32 Originally, and at the time this proceeding was commenced and tried, it also declared 'the intention of Congress that natural gas shall be sold in interstate commerce for resale for ultimate public consumption for domestic, commercial, industrial, or any other use at the lowest possible reasonable rate consistent with the maintenance of adequate service in the public interest.' FN33 While this was later dropped, there is nothing to indicate that it was not and is not still an accurate statement of purpose of the Act. Extension or improvement of facilities may be ordered when 'necessary or desirable in the public interest,' abandonment of facilities may be ordered when the supply is 'depleted to the extent that the continuance of service is unwarranted, or that the present or future public convenience or necessity ***639** permit' abandonment and certain extensions can only be made on finding of 'the present or future public convenience and necessity.' FN34 The Commission is required to take account of the ultimate use of the gas. Thus it is given power to suspend new schedules as to rates, charges, and classification of services except where the schedules are for the sale of gas 'for resale for industrial use only,' FN35 which gives the companies greater freedom to increase rates on industrial gas than on domestic gas. More particularly, the Act expressly forbids any undue preference or advantage to any person or 'any unreasonable difference in rates * * * either as between localities or as between classes of service.' FN36 And the power of the Commission expressly includes that to determine the 'just and reasonable rate, charge, classification, rule, regulation, practice, or contract to be thereafter observed and in force.' FN37

FN32 15 U.S.C. s 717(a), 15 U.S.C.A. s 717(a). (Italics supplied throughout this paragraph.)

FN33 s 7(c), 52 Stat. 825, 15 U.S.C.A. s 717f(c).

FN34 15 U.S.C. s 717f, 15 U.S.C.A. s 717f.

FN35 Id., s 717c(e).

FN36 Id., s 717c(b).

FN37 Id., s 717d(a).

In view of the Court's opinion that the Commission in administering the Act may ignore discrimination, it is interesting that in reporting this Bill both the Senate and the House Committees on Interstate Commerce pointed out that in 1934, on a nationwide average the price of natural gas per m.c.f. was 74.6 cents for domestic use, 49.6 cents for commercial use, and 16.9 for industrial use. FN38 I am not ready to think that supporters of a bill called attention to the striking fact that householders were being charged five times as much for their gas as industrial users only as a situation which the Bill would do nothing to remedy. On the other hand the Act gave to the Commission what the Court aptly describes as 'broad powers of regulation.'

FN38 Sen. Rep. No. 1162, 75th Cong., 1st Sess. 2.

***640** III.

This proceeding was initiated by the Cities of Cleveland and Akron. They alleged that the price charged by Hope for natural gas 'for resale to domestic, commercial and small industrial consumers in Cleveland and elsewhere is excessive, unjust, unreasonable, greatly in excess of the price charged by Hope to nonaffiliated companies at wholesale for resale to domestic, commercial and small industrial consumers, and greatly in excess of the price charged by Hope to East Ohio for resale to certain favored industrial consumers in Ohio, and therefore is further unduly discriminatory between consumers and between classes of service' (italics supplied). The company answered admitting differences in prices to affiliated and nonaffiliated companies and justifying them by differences in conditions of delivery.****306** As to the allegation that the contract price is 'greatly in excess of the price charged by Hope to East Ohio for resale to

certain favored industrial consumers in Ohio,' Hope did not deny a price differential, but alleged that industrial gas was not sold to 'favored consumers' but was sold under contract and schedules filed with and approved by the Public Utilities Commission of Ohio, and that certain conditions of delivery made it not 'unduly discriminatory.'

The record shows that in 1940 Hope delivered for industrial consumption 36,523,792 m.c.f. and for domestic and commercial consumption, 50,343,652 m.c.f. I find no separate figure for domestic consumption. It served 43,767 domestic consumers directly, 511,521 through the East Ohio Gas Company, and 154,043 through the Peoples Natural Gas Company, both affiliates owned by the same parent. Its special contracts for industrial consumption, so far as appear, are confined to about a dozen big industries.

***641** Hope is responsible for discrimination as exists in favor of these few industrial consumers. It controls both the resale price and use of industrial gas by virtue of the very interstate sales contracts over which the Commission is exercising its jurisdiction.

Hope's contract with East Ohio Company is an example. Hope agrees to deliver, and the Ohio Company to take, '(a) all natural gas requisite for the supply of the domestic consumers of the Ohio Company; (b) such amounts of natural gas as may be requisite to fulfill contracts made with the consent and approval of the Hope Company by the Ohio Company, or companies which it supplies with natural gas, for the sale of gas upon special terms and conditions for manufacturing purposes.' The Ohio company is required to read domestic customers' meters once a month and meters of industrial customers daily and to furnish all meter readings to Hope. The Hope Company is to have access to meters of all consumers and to all of the Ohio Company's accounts. The domestic consumers of the Ohio Company are to be fully supplied in preference to consumers purchasing for manufacturing purposes and 'Hope Company can be required to supply gas to be used for manufacturing purposes only where the same is sold under special contracts which have first been submitted to and approved in writing by the Hope Company and which expressly provide that natural gas will be supplied thereunder only in so far as the same is not necessary to meet the requirements of domestic consumers supplied through pipe lines of the Ohio Company.' This basic contract was supplemented from time to time, chiefly as to price. The last amendment was in a letter from Hope to East Ohio in 1937. It contained a special discount on industrial gas and a schedule of special industrial contracts, Hope reserving the right to make eliminations therefrom and agreeing that others might be added from time to ***642** time with its approval in writing. It said, 'It is believed that the price concessions contained in this letter, while not based on our costs, are under certain conditions, to our mutual advantage in maintaining and building up the volumes of gas sold by us (italics supplied).' FN39

FN39 The list of East Ohio Gas Company's special industrial contracts thus expressly under Hope's control and their demands are as follows:

****307** The Commission took no note of the charges of discrimination and made no disposition of the issue tendered on this point. It ordered a flat reduction in the price per m.c.f. of all gas delivered by Hope in interstate commerce. It made no limitation, condition, or provision as to what classes of consumers should get the benefit of the reduction. While the cities have accepted and are defending the reduction, it is my view that the discrimination of which they have complained is perpetuated and increased by the order of the Commission and that it violates the Act in so doing.

The Commission's opinion aptly characterizes its entire objective by saying that 'bona fide investment figures now become all-important in the regulation of rates.' It should be noted that the all-importance of this theory is not the result of any instruction from Congress. When the Bill to regulate gas was first before Congress it contained***643** the following: 'In determining just and reasonable rates the Commission shall fix such rate as will allow a fair return upon the actual legitimate prudent cost of the property used and useful for the service in question.' H.R. 5423, 74th Cong., 1st Sess. Title III, s 312(c). Congress rejected this language. See H.R. 5423, s 213 (211(c)), and H.R. Rep. No. 1318, 74th Cong., 1st Sess. 30.

The Commission contends nevertheless that the 'all important' formula for finding a rate base is that of prudent investment. But it excluded from the investment base an amount actually and admittedly invested of some $17,000,000. It did so because it says that the Company recouped these expenditures from customers before the days of regulation from earnings above a fair return. But it would not apply all of such 'excess earnings' to reduce the rate base as one of the Commissioners suggested. The reason for applying excess earnings to reduce the investment base roughly from $69,000,000 to $52,000,000 but refusing to apply them to reduce it from that to some $18,000,000 is not found in a difference in the character of the earnings or in their reinvestment. The reason assigned is a difference in bookkeeping treatment many years before the Company was subject to regulation. The $17,000,000, reinvested chiefly in well

drilling, was treated on the books as expense. (The Commission now requires that drilling costs be carried to capital account.) The allowed rate base thus actually was determined by the Company's bookkeeping, not its investment. This attributes a significance to formal classification in account keeping that seems inconsistent with rational rate regulation. FN40 Of ***644** course, the ****308** Commission would not and should not allow a rate base to be inflated by bookkeeping which had improperly capitalized expenses. I have doubts about resting public regulation upon any rule that is to be used or not depending on which side it favors.

FN40 To make a fetish of mere accounting is to shield from examination the deeper causes, forces, movements, and conditions which should govern rates. Even as a recording of current transactions, bookkeeping is hardly an exact science. As a representation of the condition and trend of a business, it uses symbols of certainty to express values that actually are in constant flux. It may be said that in commercial or investment banking or any business extending credit success depends on knowing what not to believe in accounting. Few concerns go into bankruptcy or reorganization whose books do not show them solvent and often even profitable. If one cannot rely on accountancy accurately to disclose past or current conditions of a business, the fallacy of using it as a sole guide to future price policy ought to be apparent. However, our quest for certitude is so ardent that we pay an irrational reverence to a technique which uses symbols of certainty, even though experience again and again warns us that they are delusive. Few writers have ventured to challenge this American idolatry, but see Hamilton, Cost as a standard for Price, 4 Law and Contemporary Problems 321, 323-25. He observes that 'As the apostle would put it, accountancy is all things to all men. * * * Its purpose determines the character of a system of accounts.' He analyzes the hypothetical character of accounting and says 'It was no eternal mold for pecuniary verities handed down from on high. It was-like logic or algebra, or the device of analogy in the law-an ingenious contrivance of the human mind to serve a limited and practical purpose.' 'Accountancy is far from being a pecuniary expression of all that is industrial reality. It is an instrument, highly selective in its application, in the service of the institution of money making.' As to capital account he observes 'In an enterprise in lusty competition with others of its kind, survival is the thing and the system of accounts has its focus in solvency. * * * Accordingly depreciation, obsolescence, and other factors which carry no immediate threat are matters of lesser concern and the capital account is likely to be regarded as a secondary phenomenon. * * * But in an enterprise, such as a public utility, where continued survival seems assured, solvency is likely to be taken for granted. * * * A persistent and ingenious attention is likely to be directed not so much to securing the upkeep of the physical property as to making it certain that capitalization fails in not one whit to give full recognition to every item that should go into the account.'

***645** The Company on the other hand, has not put its gas fields into its calculations on the present-value basis, although that, it contends, is the only lawful rule for finding a rate base. To do so would result in a rate higher than it has charged or proposes as a matter of good business to charge.

The case before us demonstrates the lack of rational relationship between conventional rate-base formulas and natural gas production and the extremities to which regulating bodies are brought by the effort to rationalize them. The Commission and the Company each stands on a different theory, and neither ventures to carry its theory to logical conclusion as applied to gas fields.

IV.

This order is under judicial review not because we interpose constitutional theories between a State and the business it seeks to regulate, but because Congress put upon the federal courts a duty toward administration of a new federal regulatory Act. If we are to hold that a given rate is reasonable just because the Commission has said it was reasonable, review becomes a costly, time-consuming pageant of no practical value to anyone. If on the other hand we are to bring judgment of our own to the task, we should for the guidance of the regulators and the regulated reveal something of the philosophy, be it legal or economic or social, which guides us. We need not be slaves to a formula but unless we can point out a rational way of reaching our conclusions they can only be accepted as resting on intuition or predilection. I must admit that I possess no instinct jby which to know the 'reasonable' from the 'unreasonable' in prices and must seek some conscious design for decision.

The Court sustains this order as reasonable, but what makes it so or what could possibly make it otherwise,

***646** I cannot learn. It holds that: 'it is the result reached not the method employed which is controlling'; 'the fact that the method employed to reach that result may contain infirmities is not then important' and it is not 'important to this case to determine the various permissible ways in which any rate base on which the return is computed might be arrived at.' The Court does lean somewhat on considerations of capitalization and dividend history and requirements for dividends on outstanding stock. But I can give no real weight to that for it is generally and I think deservedly in discredit as any guide in rate cases. FN41

FN41 See 2 Bonbright, Valuation of Property (1937) 1112.

Our books already contain so much talk of methods of rationalizing rates that we must appear ambiguous if we announce results without our working methods. We are confronted with regulation of a unique type of enterprise which I think requires considered rejection of much conventional utility doctrine and adoption of concepts of 'just and reasonable' rates and practices and of the 'public interest' that will take account of the peculiarities of the business.

The Court rejects the suggestions of this opinion. It says that the Committees in reporting the bill which became the Act said it provided 'for regulation along recognized and more or less standardized lines' and that there was 'nothing novel in its provisions.' So saying it sustains a rate calculated on a novel variation of a rate base theory which itself had at the time of enactment of the legislation been recognized only in dissenting opinions. Our difference seems to be between unconscious innovation, FN42 and the purposeful ****309** and deliberate innovation I ***647** would make to meet the necessities of regulating the industry before us.

FN42 Bonbright says, '* * * the vice of traditional law lies, not in its adoption of excessively rigid concepts of value and rules of valuation, but rather in its tendency to permit shifts in meaning that are inept, or else that are ill-defined because the judges that make them will not openly admit that they are doing so.' Id., 1170.

Hope's business has two components of quite divergent character. One, while not a conventional common-carrier undertaking, is essentially a transportation enterprise consisting of conveying gas from where it is produced to point of delivery to the buyer. This is a relatively routine operation not differing substantially from many other utility operations. The service is produced by an investment in compression and transmission facilities. Its risks are those of investing in a tested means of conveying a discovered supply of gas to a known market. A rate base calculated on the prudent investment formula would seem a reasonably satisfactory measure for fixing a return from that branch of the business whose service is roughly proportionate to the capital invested. But it has other consequences which must not be overlooked. It gives marketability and hence 'value' to gas owned by the company and gives the pipeline company a large power over the marketability and hence 'value' of the production of others.

The other part of the business-to reduce to possession an adequate supply of natural gas-is of opposite character, being more erratic and irregular and unpredictable in relation to investment than any phase of any other utility business. A thousand feet of gas captured and severed from real estate for delivery to consumers is recognized under our law as property of much the same nature as a ton of coal, a barrel of oil, or a yard of sand. The value to be allowed for it is the real battleground between the investor and consumer. It is from this part of the business that the chief difference between the parties as to a proper rate base arises.

It is necessary to a 'reasonable' price for gas that it be anchored to a rate base of any kind? Why did courts in the first place begin valuing 'rate bases' in order to 'value' something else? The method came into vogue ***648** in fixing rates for transportation service which the public obtained from common carriers. The public received none of the carriers' physical property but did make some use of it. The carriage was often a monopoly so there were no open market criteria as to reasonableness. The 'value' or 'cost' of what was put to use in the service by the carrier was not a remote or irrelevant consideration in making such rates. Moreover the difficulty of appraising an intangible service was thought to be simplified if it could be related to physical property which was visible and measurable and the items of which might have market value. The court hoped to reason from the known to the unknown. But gas fields turn this method topsy turvy. Gas itself is tangible, possessible, and does have a market and a price in the field. The value of the rate base is more elusive than that of gas. It consists of intangibles-leaseholds and freeholds-operated and unoperated-of little use in themselves except as rights to reach and capture gas. Their value lies almost wholly in predictions of discovery, and of price of gas when captured, and bears little relation to cost of tools and supplies and labor to develop it. Gas is what Hope sells and it can be directly priced more reasonably and easily and accurately than the

components of a rate base can be valued. Hence the reason for resort to a roundabout way of rate base price fixing does not exist in the case of gas in the field.

But if found, and by whatever method found, a rate base is little help in determining reasonableness of the price of gas. Appraisal of present value of these intangible rights to pursue fugitive gas depends on the value assigned to the gas when captured. The 'present fair value' rate base, generally in ill repute, [FN43] is not even ****310** urged by the gas company for valuing its fields.

> FN43 'The attempt to regulate rates by reference to a periodic or occasional reappraisal of the properties has now been tested long enough to confirm the worst fears of its critics. Unless its place is taken by some more promising scheme of rate control, the days of private ownership under government regulation may be numbered.' 2 Bonbright, Valuation of Property (1937) 1190.

***649** The prudent investment theory has relative merits in fixing rates for a utility which creates its service merely by its investment. The amount and quality of service rendered by the usual utility will, at least roughly, be measured by the amount of capital it puts into the enterprise. But it has no rational application where there is no such relationship between investment and capacity to serve. There is no such relationship between investment and amount of gas produced. Let us assume that Doe and Roe each produces in West Virginia for delivery to Cleveland the same quantity of natural gas per day. Doe, however, through luck or foresight or whatever it takes, gets his gas from investing $50,000 in leases and drilling. Roe drilled poorer territory, got smaller wells, and has invested $250,000. Does anybody imagine that Roe can get or ought to get for his gas five times as much as Doe because he has spent five times as much? The service one renders to society in the gas business is measured by what he gets out of the ground, not by what he puts into it, and there is little more relation between the investment and the results than in a game of poker.

Two-thirds of the gas Hope handles it buys from about 340 independent producers. It is obvious that the principle of rate-making applied to Hope's own gas cannot be applied, and has not been applied, to the bulk of the gas Hope delivers. It is not probable that the investment of any two of these producers will bear the same ratio to their investments. The gas, however, all goes to the same use, has the same utilization value and the same ultimate price.

To regulate such an enterprise by undiscriminatingly transplanting any body of rate doctrine conceived and ***650** adapted to the ordinary utility business can serve the 'public interest' as the Natural Gas Act requires, if at all, only by accident. Mr. Justice Brandeis, the pioneer juristic advocate of the prudent investment theory for man-made utilities, never, so far as I am able to discover, proposed its application to a natural gas case. On the other hand, dissenting in Commonwealth of Pennsylvania v. West Virginia, he reviewed the problems of gas supply and said, 'In no other field of public service regulation is the controlling body confronted with factors so baffling as in the natural gas industry, and in none is continuous supervision and control required in so high a degree.' 262 U.S. 553, 621, 43 S.Ct. 658, 674, 67 L.Ed. 1117, 32 A.L.R. 300. If natural gas rates are intelligently to be regulated we must fit our legal principles to the economy of the industry and not try to fit the industry to our books.

As our decisions stand the Commission was justified in believing that it was required to proceed by the rate base method even as to gas in the field. For this reason the Court may not merely wash its hands of the method and rationale of rate making. The fact is that this Court, with no discussion of its fitness, simply transferred the rate base method to the natural gas industry. It happened in Newark Natural Gas & Fuel Co. v. City of Newark, Ohio, 1917, 242 U.S. 405, 37 S.Ct. 156, 157, 61 L.Ed. 393, Ann.Cas.1917B, 1025, in which the company wanted 25 cents per m.c.f., and under the Fourteenth Amendment challenged the reduction to 18 cents by ordinance. This Court sustained the reduction because the court below 'gave careful consideration to the questions of the value of the property * * * at the time of the inquiry,' and whether the rate 'would be sufficient to provide a fair return on the value of the property.' The Court said this method was 'based upon principles thoroughly established by repeated secisions of this court,' citing many cases, not one of which involved natural gas or a comparable wasting natural resource. Then came issues as to state power to ***651** regulate as affected by the commerce clause. Public Utilities Commission v. Landon, 1919, 249 U.S. 236, 39 S.Ct. 268, 63 L.Ed. 577; Pennsylvania Gas Co. v. Public Service Commission, 1920, 252 U.S. 23, 40 S.Ct. 279, 64 L.Ed. 434. These questions settled, the Court again was called upon in natural gas cases to consider state rate-making claimed to be invalid under the Fourteenth Amendment. United Fuel Gas Co. v. Railroad Commission of Kentucky, 1929, 278 U.S. 300, 49 S.Ct. 150, 73 L.Ed. 390; United Fuel Gas Company v. Public Service Commission of West Virginia, 1929, 278 U.S. 322, 49 S.Ct. 157, 73 L.Ed. 402. Then, as now, the differences were 'due ****311** chiefly to the difference in value ascribed by each to the gas rights and leaseholds.' 278 U.S. 300, 311, 49 S.Ct. 150, 153, 73 L.Ed. 390. No one seems to have questioned that the rate

base method must be pursued and the controversy was at what rate base must be used. Later the 'value' of gas in the field was questioned in determining the amount a regulated company should be allowed to pay an affiliate therefor-a state determination also reviewed under the Fourteenth Amendment. Dayton Power & Light Co. v. Public Utilities Commission of Ohio, 1934, 292 U.S. 290, 54 S.Ct. 647, 78 L.Ed. 1267; Columbus Gas & Fuel Co. v. Public Utilities Commission of Ohio, 1934, 292 U.S. 398, 54 S.Ct. 763, 78 L.Ed. 1327, 91 A.L.R. 1403. In both cases, one of which sustained, and one of which struck down a fixed rate the Court assumed the rate base method, as the legal way of testing reasonableness of natural gas prices fixed by public authority, without examining its real relevancy to the inquiry.

Under the weight of such precedents we cannot expect the Commission to initiate economically intelligent methods of fixing gas prices. But the Court now faces a new plan of federal regulation based on the power to fix the price at which gas shall be allowed to move in interstate commerce. I should now consider whether these rules devised under the Fourteenth Amendment are the exclusive tests of a just and reasonable rate under the federal statute, inviting reargument directed to that point ***652** if necessary. As I see it now I would be prepared to hold that these rules do not apply to a natural gas case arising under the Natural Gas Act.

Such a holding would leave the Commission to fix the price of gas in the field as one would fix maximum prices of oil or milk or coal, or any other commodity. Such a price is not calculated to produce a fair return on the synthetic value of a rate base of any individual producer, and would not undertake to assure a fair return to any producer. The emphasis would shift from the producer to the product, which would be regulated with an eye to average or typical producing conditions in the field.

Such a price fixing process on economic lines would offer little temptation to the judiciary to become back seat drivers of the price fixing machine. The unfortunate effect of judicial intervention in this field is to divert the attention of those engaged in the process from what is economically wise to what is legally permissible. It is probable that price reductions would reach economically unwise and self-defeating limits before they would reach constitutional ones. Any constitutional problems growing out of price fixing are quite different than those that have heretofore been considered to inhere in rate making. A producer would have difficulty showing the invalidity of such a fixed price so long as he voluntarily continued to sell his product in interstate commerce. Should he withdraw and other authority be invoked to compel him to part with his property, a different problem would be presented.

Allowance in a rate to compensate for gas removed from gas lands, whether fixed as of point of production or as of point of delivery, probably best can be measured by a functional test applied to the whole industry. For good or ill we depend upon private enterprise to exploit these natural resources for public consumption. The function which an allowance for gas in the field should perform ***653** for society in such circumstances is to be enough and no more than enough to induce private enterprise completely and efficiently to utilize gas resources, to acquire for public service any available gas or gas rights and to deliver gas at a rate and for uses which will be in the future as well as in the present public interest.

The Court fears that 'if we are now to tell the Commission to fix the rates so as to discourage particular uses, we would indeed be injecting into a rate case a 'novel' doctrine * * *.' With due deference I suggest that there is nothing novel in the idea that any change in price of a service or commodity reacts to encourage or discourage its use. The question is not whether such consequences will or will not follow; the question is whether effects must be suffered blindly or may be intelligently selected, whether price control shall have targets at which it deliberately aims or shall be handled like a gun in the hands of one who does not know it is loaded.

We should recognize 'price' for what it is-a tool, a means, an expedient. In public****312** hands it has much the same economic effects as in private hands. Hope knew that a concession in industrial price would tend to build up its volume of sales. It used price as an expedient to that end. The Commission makes another cut in that same price but the Court thinks we should ignore the effect that it will have on exhaustion of supply. The fact is that in natural gas regulation price must be used to reconcile the private property right society has permitted to vest in an important natural resource with the claims of society upon it-price must draw a balance between wealth and welfare.

To carry this into techniques of inquiry is the task of the Commissioner rather than of the judge, and it certainly is no task to be solved by mere bookkeeping but requires the best economic talent available. There would doubtless be inquiry into the price gas is bringing in the ***654** field, how far that price is established by arms' length bargaining and how far it may be influenced by agreements in restraint of trade or monopolistic influences. What must Hope really pay to get and to replace gas it delivers under this order? If it should get more or less than that for its own, how much and why? How far are such prices influenced by pipe line access to

markets and if the consumers pay returns on the pipe lines how far should the increment they cause go to gas producers? East Ohio is itself a producer in Ohio. [FN44] What do Ohio authorities require Ohio consumers to pay for gas in the field? Perhaps these are reasons why the Federal Government should put West Virginia gas at lower or at higher rates. If so what are they? Should East Ohio be required to exploit its half million acres of unoperated reserve in Ohio before West Virginia resources shall be supplied on a devalued basis of which that State complains and for which she threatens measures of self keep? What is gas worth in terms of other fuels it displaces?

FN44 East Ohio itself owns natural gas rights in 550,600 acres, 518,526 of which are reserved and 32,074 operated, by 375 wells. Moody's Manual of Public Utilities (1943) 5.

A price cannot be fixed without considering its effect on the production of gas. Is it an incentive to continue to exploit vast unoperated reserves? Is it conducive to deep drilling tests the result of which we may know only after trial? Will it induce bringing gas from afar to supplement or even to substitute for Appalachian gas? [FN45] Can it be had from distant fields as cheap or cheaper? If so, that competitive potentiality is certainly a relevant consideration. Wise regulation must also consider, as a private buyer would, what alternatives the producer has ***655** if the price is not acceptable. Hope has intrastate business and domestic and industrial customers. What can it do by way of diverting its supply to intrastate sales? What can it do by way of disposing of its operated or reserve acreage to industrial concerns or other buyers? What can West Virginia do by way of conservation laws, severance or other taxation, if the regulated rate offends? It must be borne in mind that while West Virginia was prohibited from giving her own inhabitants a priority that discriminated against interstate commerce, we have never yet held that a good faith conservation act, applicable to her own, as well as to others, is not valid. In considering alternatives, it must be noted that federal regulation is very incomplete, expressly excluding regulation of 'production or gathering of natural gas,' and that the only present way to get the gas seems to be to call it forth by price inducements. It is plain that there is a downward economic limit on a safe and wise price.

FN45 Hope has asked a certificate of convenience and necessity to lay 1140 miles of 22-inch pipeline from Hugoton gas fields in southwest Kansas to West Virginia to carry 285 million cu. ft. of natural gas per day. The cost was estimated at $51,000,000. Moody's Manual of Public Utilities (1943) 1760.

But there is nothing in the law which compels a commission to fix a price at that 'value' which a company might give to its product by taking advantage of scarcity, or monopoly of supply. The very purpose of fixing maximum prices is to take away from the seller his opportunity to get all that otherwise the market would award him for his goods. This is a constitutional use of the power to fix maximum prices, ****313**Block v. Hirsh, 256 U.S. 135, 41 S.Ct. 458, 65 L.Ed. 865, 16 A.L.R. 165; Marcus Brown Holding Co. v. Feldman, 256 U.S. 170, 41 S.Ct. 465, 65 L.Ed. 877; International Harvester Co. v. Kentucky, 234 U.S. 216, 34 S.Ct. 853, 58 L.Ed. 1284; Highland v. Russell Car & Snow Plow Co., 279 U.S. 253, 49 S.Ct. 314, 73 L.Ed. 688, just as the fixing of minimum prices of goods in interstate commerce is constitutional although it takes away from the buyer the advantage in bargaining which market conditions would give him. United States v. Darby, 312 U.S. 100, 657, 61 S.Ct. 451, 85 L.Ed. 609, 132 A.L.R. 1430; Mulford v. Smith, 307 U.S. 38, 59 S.Ct. 648, 83 L.Ed. 1092; United States v. Rock Royal Co-operative, Inc., 307 U.S. 533, 59 S.Ct. 993, 83 L.Ed. 1446; Sunshine Anthracite Coal Co. v. Adkins, 310 U.S. 381, 60 S.Ct. 907, 84 L.Ed. 1263. The Commission has power to fix ***656** a price that will be both maximum and minimum and it has the incidental right, and I think the duty, to choose the economic consequences it will promote or retard in production and also more importantly in consumption, to which I now turn.

If we assume that the reduction in company revenues is warranted we then come to the question of translating the allowed return into rates for consumers or classes of consumers. Here the Commission fixed a single rate for all gas delivered irrespective of its use despite the fact that Hope has established what amounts to two rates-a high one for domestic use and a lower one for industrial contracts. [FN46] The Commission can fix two prices for interstate gas as readily as one-a price for resale to domestic users and another for resale to industrial users. This is the pattern Hope itself has established in the very contracts over which the Commission is expressly given jurisdiction. Certainly the Act is broad enough to permit two prices to be fixed instead of one, if the concept of the 'public interest' is not unduly narrowed.

FN46 I find little information as to the rates for industries in the record and none at all in such usual sources as Moody's Manual.

The Commission's concept of the public interest in natural

gas cases which is carried today into the Court's opinion was first announced in the opinion of the minority in the Pipeline case. It enumerated only two 'phases of the public interest: (1) the investor interest; (2) the consumer interest,' which it emphasized to the exclusion of all others. 315 U.S. 575, 606, 62 S.Ct. 736, 753, 86 L.Ed. 1037. This will do well enough in dealing with railroads or utilities supplying manufactured gas, electric, power, a communications service or transportation, where utilization of facilities does not impair their future usefulness. Limitation of supply, however, brings into a natural gas case another phase of the public interest that to my mind overrides both the owner ***657** and the consumer of that interest. Both producers and industrial consumers have served their immediate private interests at the expense of the long-range public interest. The public interest, of course, requires stopping unjust enrichment of the owner. But it also requires stopping unjust impoverishment of future generations. The public interest in the use by Hope's half million domestic consumers is quite a different one from the public interest in use by a baker's dozen of industries.

Prudent price fixing it seems to me must at the very threshold determine whether any part of an allowed return shall be permitted to be realized from sales of gas for resale for industrial use. Such use does tend to level out daily and seasonal peaks of domestic demand and to some extent permits a lower charge for domestic service. But is that a wise way of making gas cheaper when, in comparison with any substitute, gas is already a cheap fuel? The interstate sales contracts provide that at times when demand is so great that there is not enough gas to go around domestic users shall first be served. Should the operation of this preference await the day of actual shortage? Since the propriety of a preference seems conceded, should it not operate to prevent the coming of a shortage as well as to mitigate its effects? Should industrial use jeopardize tomorrow's service to householders any more than today's? If, however, it is decided to cheapen domestic use by resort to industrial sales, should they be limited to the few uses ****314** for which gas has special values or extend also to those who use it only because it is cheaper than competitive fuels? FN47 And how much cheaper should industrial***658** gas sell than domestic gas, and how much advantage should it have over competitive fuels? If industrial gas is to contribute at all to lowering domestic rates, should it not be made to contribute the very maximum of which it is capable, that is, should not its price be the highest at which the desired volume of sales can be realized?

FN47 The Federal Power Commission has touched upon the problem of conservation in connection with an application for a certificate permitting construction of a 1500-mile pipeline from southern Texas to New York City and says: 'The Natural Gas Act as presently drafted does not enable the Commission to treat fully the serious implications of such a problem. The question should be raised as to whether the proposed use of natural gas would not result in displacing a less valuable fuel and create hardships in the industry already supplying the market, while at the same time rapidly depleting the country's natural-gas reserves. Although, for a period of perhaps 20 years, the natural gas could be so priced as to appear to offer an apparent saving in fuel costs, this would mean simply that social costs which must eventually be paid had been ignored.
'Careful study of the entire problem may lead to the conclusion that use of natural gas should be restricted by functions rather than by areas. Thus, it is especially adapted to space and water heating in urban homes and other buildings and to the various industrial heat processes which require concentration of heat, flexibility of control, and uniformity of results. Industrial uses to which it appears particularly adapted include the treating and annealing of metals, the operation of kilns in the ceramic, cement, and lime industries, the manufacture of glass in its various forms, and use as a raw material in the chemical industry. General use of natural gas under boilers for the production of steam is, however, under most circumstances of very questionable social economy.' Twentieth Annual Report of the Federal Power Commission (1940) 79.

If I were to answer I should say that the household rate should be the lowest that can be fixed under commercial conditions that will conserve the supply for that use. The lowest probable rate for that purpose is not likely to speed exhaustion much, for it still will be high enough to induce economy, and use for that purpose has more nearly reached the saturation point. On the other hand the demand for industrial gas at present rates already appears to be increasing. To lower further the industrial rate is merely further to subsidize industrial consumption and speed depletion. The impact of the flat reduction ***659** of rates ordered here admittedly will be to increase the industrial advantages of gas over competing fuels and to increase its use. I think this is not, and there is no finding by the Commission that it is, in the public interest.

There is no justification in this record for the present discrimination against domestic users of gas in favor of industrial users. It is one of the evils against which the Natural Gas Act was aimed by Congress and one of the evils complained of here by Cleveland and Akron. If

Hope's revenues should be cut by some $3,600,000 the whole reduction is owing to domestic users. If it be considered wise to raise part of Hope's revenues by industrial purpose sales, the utmost possible revenue should be raised from the least consumption of gas. If competitive relationships to other fuels will permit, the industrial price should be substantially advanced, not for the benefit of the Company, but the increased revenues from the advance should be applied to reduce domestic rates. For in my opinion the 'public interest' requires that the great volume of gas now being put to uneconomic industrial use should either be saved for its more important future domestic use or the present domestic user should have the full benefit of its exchange value in reducing his present rates.

Of course the Commission's power directly to regulate does not extend to the fixing of rates at which the local company shall sell to consumers. Nor is such power required to accomplish the purpose. As already pointed out, the very contract the Commission is altering classifies the gas according to the purposes for which it is to be resold and provides differentials between the two classifications. It would only be necessary for the Commission to order ****315** that all gas supplied under paragraph (a) of Hope's contract with the East Ohio Company shall be ***660** at a stated price fixed to give to domestic service the entire reduction herein and any further reductions that may prove possible by increasing industrial rates. It might further provide that gas delivered under paragraph (b) of the contract for industrial purposes to those industrial customers Hope has approved in writing shall be at such other figure as might be found consistent with the public interest as herein defined. It is too late in the day to contend that the authority of a regulatory commission does not extend to a consideration of public interests which it may not directly regulate and a conditioning of its orders for their protection. Interstate Commerce Commission v. Railway Labor Executives Ass'n, 315 U.S. 373, 62 S.Ct. 717, 86 L.Ed. 904; United States v. Lowden, 308 U.S. 225, 60 S.Ct. 248, 84 L.Ed. 208.

Whether the Commission will assert its apparently broad statutory authorization over prices and discriminations is, of course, its own affair, not ours. It is entitled to its own notion of the 'public interest' and its judgment of policy must prevail. However, where there is ground for thinking that views of this Court may have constrained the Commission to accept the rate-base method of decision and a particular single formula as 'all important' for a rate base, it is appropriate to make clear the reasons why I, at least, would not be so understood. The Commission is free to face up realistically to the nature and peculiarity of the resources in its control, to foster their duration in fixing price, and to consider future interests in addition to those of investors and present consumers. If we return this case it may accept or decline the proffered freedom. This problem presents the Commission an unprecedented opportunity if it will boldly make sound economic considerations, instead of legal and accounting theories, the foundation of federal policy. I would return the case to the Commission and thereby be clearly quit of what now may appear to be some responsibility for perpetrating a shortsighted pattern of natural gas regulation.

U.S. 1944.
Federal Power Commission v. Hope Natural Gas Co.
51 P.U.R.(NS) 193, 320 U.S. 591, 64 S.Ct. 281, 88 L.Ed. 333

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43 S.Ct. 675 Page 1
P.U.R. 1923D 11, 262 U.S. 679, 43 S.Ct. 675, 67 L.Ed. 1176
(Cite as: P.U.R. 1923D 11, 43 S.Ct. 675)

Supreme Court of the United States
BLUEFIELD WATERWORKS & IMPROVEMENT CO.
v.
PUBLIC SERVICE COMMISSION OF WEST VIRGINIA et al.
No. 256.

Argued January 22, 1923.
Decided June 11, 1923.

In Error to the Supreme Court of Appeals of West Virginia.

Proceedings by the Bluefield Waterworks & Improvement Company against the Public Service Commission of the State of West Virginia and others to suspend and set aside an order of the Commission fixing rates. From a judgment of the Supreme Court of West Virginia, dismissing the petition, and denying the relief (89 W. Va. 736, 110 S. E. 205), the Waterworks Company bring error. Reversed.

West Headnotes

Constitutional Law 92 298(1.5)

92 Constitutional Law
92XII Due Process of Law
92k298 Regulation of Charges and Prices
92k298(1.5) k. Public Utilities in General. Most Cited Cases
Rates which are not sufficient to yield a reasonable return on the value of the property used in public service at the time it is being so used to render the service are unjust, unreasonable, and confiscatory, and their enforcement deprives the public utility company of its property, in violation of the Fourteenth Amendment of the Constitution.

Constitutional Law 92 298(3)

92 Constitutional Law
92XII Due Process of Law
92k298 Regulation of Charges and Prices
92k298(3) k. Water and Irrigation Companies. Most Cited Cases
Under the due process clause of the Fourteenth Amendment of the Constitution, U.S.C.A., a waterworks company is entitled to the independent judgment of the court as to both law and facts, where the question is whether the rates fixed by a public service commission are confiscatory.

Waters and Water Courses 405 203(10)

405 Waters and Water Courses
405IX Public Water Supply
405IX(A) Domestic and Municipal Purposes
405k203 Water Rents and Other Charges
405k203(10) k. Reasonableness of Charges. Most Cited Cases
It was error for a state public service commission, in arriving at the value of the property used in public service, for the purpose of fixing the rates, to fail to give proper weight to the greatly increased cost of construction since the war.

Waters and Water Courses 405 203(10)

405 Waters and Water Courses
405IX Public Water Supply
405IX(A) Domestic and Municipal Purposes
405k203 Water Rents and Other Charges
405k203(10) k. Reasonableness of Charges. Most Cited Cases
A public utility is entitled to such rates as will permit it to earn a return on the value of the property which it employs for the convenience of the public equal to that generally being made at the same time and in the same general part of the country on investments in other business undertakings which are attended by corresponding risks and uncertainties, but it has no constitutional right to such profits as are realized or anticipated in highly profitable enterprises or speculative ventures.

Waters and Water Courses 405 203(10)

405 Waters and Water Courses
405IX Public Water Supply
405IX(A) Domestic and Municipal Purposes
405k203 Water Rents and Other Charges
405k203(10) k. Reasonableness

(Cite as: P.U.R. 1923D 11, 43 S.Ct. 675)

of Charges. Most Cited Cases
Since the investors take into account the result of past operations as well as present rates in determining whether they will invest, a waterworks company which had been earning a low rate of returns through a long period up to the time of the inquiry is entitled to return of more than 6 per cent. on the value of its property used in the public service, in order to justly compensate it for the use of its property.

Federal Courts 170B 504.1

170B Federal Courts
170BVII Supreme Court
170BVII(E) Review of Decisions of State Courts
170Bk504 Nature of Decisions or Questions Involved
170Bk504.1 k. In General. Most Cited Cases
(Formerly 106k394(6))
A proceeding in a state court attacking an order of a public service commission fixing rates, on the ground that the rates were confiscatory and the order void under the federal Constitution, is one where there is drawn in question the validity of authority exercised under the state, on the ground of repugnancy to the federal Constitution, and therefore is reviewable by writ of error.

****675 *680** Messrs. Alfred G. Fox and Jos. M. Sanders, both of Bluefield, W. Va., for plaintiff in error.
Mr. Russell S. Ritz, of Bluefield, W. Va., for defendants in error.

***683** Mr. Justice BUTLER delivered the opinion of the Court.
Plaintiff in error is a corporation furnishing water to the city of Bluefield, W. Va., ****676** and its inhabitants. September 27, 1920, the Public Service Commission of the state, being authorized by statute to fix just and reasonable rates, made its order prescribing rates. In accordance with the laws of the state (section 16, c. 15-O, Code of West Virginia [sec. 651]), the company instituted proceedings in the Supreme Court of Appeals to suspend and set aside the order. The petition alleges that the order is repugnant to the Fourteenth Amendment, and deprives the company of its property without just compensation and without due process of law, and denies it equal protection of the laws. A final judgment was entered, denying the company relief and dismissing its petition. The case is here on writ of error.

[1] 1. The city moves to dismiss the writ of error for the reason, as it asserts, that there was not drawn in question the validity of a statute or an authority exercised under the state, on the ground of repugnancy to the federal Constitution.

The validity of the order prescribing the rates was directly challenged on constitutional grounds, and it was held valid by the highest court of the state. The prescribing of rates is a legislative act. The commission is an instrumentality of the state, exercising delegated powers. Its order is of the same force as would be a like enactment by the Legislature. If, as alleged, the prescribed rates are confiscatory, the order is void. Plaintiff in error is entitled to bring the case here on writ of error and to have that question decided by this court. The motion to dismiss will be denied. See ***684**Oklahoma Natural Gas Co. v. Russell, 261 U. S. 290, 43 Sup. Ct. 353, 67 L. Ed. 659, decided March 5, 1923, and cases cited; also Ohio Valley Co. v. Ben Avon Borough, 253 U. S. 287, 40 Sup. Ct. 527, 64 L. Ed. 908.

2. The commission fixed $460,000 as the amount on which the company is entitled to a return. It found that under existing rates, assuming some increase of business, gross earnings for 1921 would be $80,000 and operating expenses $53,000 leaving $27,000, the equivalent of 5.87 per cent., or 3.87 per cent. after deducting 2 per cent. allowed for depreciation. It held existing rates insufficient to the extent of 10,000. Its order allowed the company to add 16 per cent. to all bills, excepting those for public and private fire protection. The total of the bills so to be increased amounted to $64,000; that is, 80 per cent. of the revenue was authorized to be increased 16 per cent., equal to an increase of 12.8 per cent. on the total, amounting to $10,240.

As to value: The company claims that the value of the property is greatly in excess of $460,000. Reference to the evidence is necessary. There was submitted to the commission evidence of value which it summarized substantially as follows:

a. Estimate by company's engineer

(Cite as: P.U.R. 1923D 11, 43 S.Ct. 675)

	on. basis of reproduction new, less. depreciation, at prewar prices.	$ 624,548 00
b.	Estimate by company's engineer on. basis of reproduction new, less. depreciation, at 1920 prices.	1,194,663 00
c.	Testimony of company's engineer. fixing present fair value for rate. making purposes.	900,000 00
d.	Estimate by commissioner's engineer on. basis of reproduction new, less. depreciation at 1915 prices, plus. additions since December 31, 1915, at. actual cost, excluding Bluefield. Valley waterworks, water rights,. and going value.	397,964 38
e.	Report of commission's statistician. showing investment cost less. depreciation.	365,445 13
f.	Commission's valuation, as fixed in. case No. 368 ($360,000), plus gross. additions to capital since made. ($92,520.53).	452,520 53

***685** It was shown that the prices prevailing in 1920 were nearly double those in 1915 and pre-war time. The company did not claim value as high as its estimate of cost of construction in 1920. Its valuation engineer testified that in his opinion the value of the property was $900,000-a figure between the cost of construction in 1920, less depreciation, and the cost of construction in 1915 and before the war, less depreciation.

The commission's application of the evidence may be stated briefly as follows:

As to 'a,' supra: The commission deducted $204,000 from the estimate (details printed in the margin), [FN1] leaving approximately $421,000, which it contrasted with the estimate of its own engineer, $397,964.38 (see 'd,' supra). It found that there should be included $25,000 for the Bluefield Valley waterworks plant in Virginia, 10 per cent. for going value, and $10,000 for working capital. If these be added to $421,000, there results $500,600. This may be compared with the commission's final figure, $460,000.

FN1

Difference in depreciation allowed.	$ 49,000
Preliminary organization and development. cost.	14,500
Bluefield Valley waterworks plant.	25,000
Water rights.	50,000
Excess overhead costs.	39,000
Paving over mains.	28,500
	$204,000

(Cite as: P.U.R. 1923D 11, 43 S.Ct. 675)

***686** As to 'b' and 'c,' supra: These were given no weight by the commission in arriving at its final figure, $460,000. It said:
'Applicant's plant was originally constructed more than twenty years ago, and has been added to from time to time as the progress and development of the community required. For this reason, it would be unfair to its consumers to use as a basis for present fair value the abnormal prices prevailing during the recent war period; but, when, as in this case, a part of the plant has been constructed or added to during that period, in fairness to the applicant, consideration must be given to the cost of such expenditures made to meet the demands of the public.'

****677** As to 'd,' supra: The commission, taking $400,000 (round figures), added $25,000 for Bluefield Valley waterworks plant in Virginia, 10 per cent. for going value, and $10,000 for working capital, making $477,500. This may be compared with its final figure, $460,000.

As to 'e,' supra: The commission, on the report of its statistician, found gross investment to be $500,402.53. Its engineer, applying the straight line method, found 19 per cent. depreciation. It applied 81 per cent. to gross investment and added 10 per cent. for going value and $10,000 for working capital, producing $455,500. [FN2] This may be compared with its final figure, $460,000.

'The books of the company show a total gross investment,

FN2 As to 'e': $365,445.13 represents investment cost less depreciation. The gross investment was found to be $500,402.53, indicating a deduction on account of depreciation of $134,957.40, about 27 per cent., as against 19 per cent. found by the commission's engineer.

As to 'f,' supra: It is necessary briefly to explain how this figure, $452,520.53, was arrived at. Case No. 368 was a proceeding initiated by the application of the company for higher rates, April 24, 1915. The commission made a valuation as of January 1, 1915. There were presented two estimates of reproduction cost less depreciation, one by a valuation engineer engaged by the company, ***687** and the other by a valuation engineer engaged by the city, both 'using the same method.' An inventory made by the company's engineer was accepted as correct by the city and by the commission. The method 'was that generally employed by courts and commissions in arriving at the value of public utility properties under this method.' and in both estimates 'five year average unit prices' were applied. The estimate of the company's engineer was $540,000 and of the city's engineer, $392,000. The principal differences as given by the commission are shown in the margin. [FN3] The commission disregarded both estimates and arrived at $360,000. It held that the best basis of valuation was the net investment, i. e., the total cost of the property less depreciation. It said:

FN3

		Company Engineer.	City Engineer.
1.	Preliminary costs.	$14,455	$1,000
2.	Water rights.	50,000	Nothing
3.	Cutting pavements over. mains.	27,744	233
4.	Pipe lines from gravity. springs.	22,072	15,442
5.	Laying cast iron street. mains.	19,252	15,212
6.	Reproducing Ada springs.	18,558	13,027
7.	Superintendence and. engineering.	20,515	13,621
8.	General contingent cost.	16,415	5,448
		$189,011	$63,983

since its organization, of $407,882, and that there has been charged off for depreciation from year to year the total sum of $83,445, leaving a net investment of

$324,427. * * * From an examination of the books * * * it appears that the records of the company have been remarkably well kept and preserved. It therefore seems that, when a plant is developed under these conditions, the net investment, which, of course, means the total gross investment less depreciation, is the very best basis of valuation for rate making purposes and that the other methods above referred to should ***688** be used only when it is impossible to arrive at the true investment. Therefore, after making due allowance for capital necessary for the conduct of the business and considering the plant as a going concern, it is the opinion of the commission that the fair value for the purpose of determining reasonable and just rates in this case of the property of the applicant company, used by it in the public service of supplying water to the city of Bluefield and its citizens, is the sum of $360,000, which sum is hereby fixed and determined by the commission to be the fair present value for the said purpose of determining the reasonable and just rates in this case.'

In its report in No. 368, the commission did not indicate the amounts respectively allowed for going value or working capital. If 10 per cent. be added for the former, and $10,000 for the latter (as fixed by the commission in the present case), there is produced $366,870, to be compared with $360,000, found by the commission in its valuation as of January 1, 1915. To this it added $92,520.53, expended since, producing $452,520.53. This may be compared with its final figure, $460,000.

The state Supreme Court of Appeals holds that the valuing of the property of a public utility corporation and prescribing rates are purely legislative acts, not subject to judicial review, except in so far as may be necessary to determine whether such rates are void on constitutional or other grounds, and that findings of fact by the commission based on evidence to support them will not be reviewed by the court. City of Bluefield v. Waterworks, 81 W. Va. 201, 204, 94 S. E. 121; Coal & Coke Co. v. Public Service Commission, 84 W. Va. 662, 678, 100 S. E. 557, 7 A. L. R. 108; Charleston v. Public Service Commission, 86 W. Va. 536, 103 S. E. 673.

In this case (89 W. Va. 736, 738, 110 S. E. 205, 206) it said:
'From the written opinion of the commission we find that it ascertained the value of the petitioner's property for rate making [then quoting the commission] 'after ***689** maturely and carefully considering the various methods presented for the ascertainment of fair value and giving such weight as seems proper to every element involved and all the facts and circumstances disclosed by the record.''

[2] [3] The record clearly shows that the commission, in arriving at its final figure, did not accord proper, if any, weight to the greatly enhanced costs of construction in 1920 over those prevailing about 1915 and before the war, as established by uncontradicted ****678** evidence; and the company's detailed estimated cost of reproduction new, less depreciation, at 1920 prices, appears to have been wholly disregarded. This was erroneous. Missouri ex rel. Southwestern Bell Telephone Co. v. Public Service Commission of Missouri, 262 U. S. 276, 43 Sup. Ct. 544, 67 L. Ed. 981, decided May 21, 1923. Plaintiff in error is entitled under the due process clause of the Fourteenth Amendment to the independent judgment of the court as to both law and facts. Ohio Valley Co. v. Ben Avon Borough, 253 U. S. 287, 289, 40 Sup. Ct. 527, 64 L. Ed. 908, and cases cited.

We quote further from the court's opinion (89 W. Va. 739, 740, 110 S. E. 206):
'In our opinion the commission was justified by the law and by the facts in finding as a basis for rate making the sum of $460,000.00. * * * In our case of Coal & Coke Ry. Co. v. Conley, 67 W. Va. 129, it is said: 'It seems to be generally held that, in the absence of peculiar and extraordinary conditions, such as a more costly plant than the public service of the community requires, or the erection of a plant at an actual, though extravagant, cost, or the purchase of one at an exorbitant or inflated price, the actual amount of money invested is to be taken as the basis, and upon this a return must be allowed equivalent to that which is ordinarily received in the locality in which the business is done, upon capital invested in similar enterprises. In addition to this, consideration must be given to the nature of the investment, a higher rate ***690** being regarded as justified by the risk incident to a hazardous investment.'
'That the original cost considered in connection with the history and growth of the utility and the value of the services rendered constitute the principal elements to be considered in connection with rate making, seems to be supported by nearly all the authorities.'

[4] The question in the case is whether the rates prescribed in the commission's order are confiscatory and therefore beyond legislative power. Rates which are not sufficient to yield a reasonable return on the value of the property used at the time it is being used to render the service are unjust, unreasonable and confiscatory, and their enforcement deprives the public utility company of its property in violation of the Fourteenth Amendment. This is so well settled by numerous decisions of this court that citation of the cases is scarcely necessary:

'What the company is entitled to ask is a fair return upon the value of that which it employs for the public convenience.' Smyth v. Ames (1898) 169 U. S. 467, 547, 18 Sup. Ct. 418, 434 (42 L. Ed. 819).
'There must be a fair return upon the reasonable value of the property at the time it is being used for the public. * * * And we concur with the court below in holding that the value of the property is to be determined as of the time when the inquiry is made regarding the rates. If the property, which legally enters into the consideration of the question of rates, has increased in value since it was acquired, the company is entitled to the benefit of such increase.' Willcox v. Consolidated Gas Co. (1909) 212 U. S. 19, 41, 52, 29 Sup. Ct. 192, 200 (53 L. Ed. 382, 15 Ann. Cas. 1034, 48 L. R. A. [N. S.] 1134).
'The ascertainment of that value is not controlled by artificial rules. It is not a matter of formulas, but there must be a reasonable judgment having its basis in a proper consideration of all relevant facts.' Minnesota Rate Cases (1913) 230 U. S. 352, 434, 33 Sup. Ct. 729, 754 (57 L. Ed. 1511, 48 L. R. A. [N. S.] 1151, Ann. Cas. 1916A, 18).
***691** 'And in order to ascertain that value, the original cost of construction, the amount expended in permanent improvements, the amount and market value of its bonds and stock, the present as compared with the original cost of construction, the probable earning capacity of the property under particular rates prescribed by statute, and the sum required to meet operating expenses, are all matters for consideration, and are to be given such weight as may be just and right in each case. We do not say that there may not be other matters to be regarded in estimating the value of the property.' Smyth v. Ames, 169 U. S., 546, 547, 18 Sup. Ct. 434, 42 L. Ed. 819.
'* * * The making of a just return for the use of the property involves the recognition of its fair value if it be more than its cost. The property is held in private ownership and it is that property, and not the original cost of it, of which the owner may not be deprived without due process of law.'

Minnesota Rate Cases, 230 U. S. 454, 33 Sup. Ct. 762, 57 L. Ed. 1511, 48 L. R. A. (N. S.) 1151, Ann. Cas. 1916A, 18.

In Missouri ex rel. Southwestern Bell Telephone Co., v. Public Service Commission of Missouri, supra, applying the principles of the cases above cited and others, this court said:
'Obviously, the commission undertook to value the property without according any weight to the greatly enhanced costs of material, labor, supplies, etc., over those prevailing in 1913, 1914, and 1916. As matter of common knowledge, these increases were large. Competent witnesses estimated them as 45 to 50 per centum. * * * It is impossible to ascertain what will amount to a fair return upon properties devoted to public service, without giving consideration to the cost of labor, supplies, etc., at the time the investigation is made. An honest and intelligent forecast of probable future values, made upon a view of all the relevant circumstances, is essential. If the highly important element of present costs is wholly disregarded, such a forecast becomes impossible. Estimates for to-morrow cannot ignore prices of to-day.'

[5] ***692** It is clear that the court also failed to give proper consideration to the higher cost of construction in 1920 over that in 1915 and before the war, and failed to give weight to cost of reproduction less depreciation on the basis of 1920 prices, or to the testimony of the company's valuation engineer, based on present and past costs of construction, that the property in his opinion, was worth $900,000. The final figure, $460,000, was arrived ****679** at substantially on the basis of actual cost, less depreciation, plus 10 per cent. for going value and $10,000 for working capital. This resulted in a valuation considerably and materially less than would have been reached by a fair and just consideration of all the facts. The valuation cannot be sustained. Other objections to the valuation need not be considered.

3. Rate of return: The state commission found that the company's net annual income should be approximately $37,000, in order to enable it to earn 8 per cent. for return and depreciation upon the value of its property as fixed by it. Deducting 2 per cent. for depreciation, there remains 6 per cent. on $460,000, amounting to $27,600 for return. This was approved by the state court.

[6] The company contends that the rate of return is too low and confiscatory. What annual rate will constitute just compensation depeds upon many circumstances, and must be determined by the exercise of a fair and enlightened judgment, having regard to all relevant facts. A public utility is entitled to such rates as will permit it to earn a return on the value of the property which it employs for the convenience of the public equal to that generally being made at the same time and in the same general part of the country on investments in other business undertakings which are attended by corresponding, risks and uncertainties; but it has no constitutional right to profits such as are realized or anticipated in ***693** highly profitable enterprises or speculative ventures. The return should be reasonably sufficient to assure confidence in the financial soundness of the utility and should be adequate, under efficient and economical management, to maintain and support its credit and enable it to raise the money necessary for the proper discharge of its public duties. A

rate of return may be reasonable at one time and become too high or too low by changes affecting opportunities for investment, the money market and business conditions generally.

In 1909, this court, in Willcox v. Consolidated Gas Co., 212 U. S. 19, 48-50, 29 Sup. Ct. 192, 53 L. Ed. 382, 15 Ann. Cas. 1034, 48 L. R. A. (N. S.) 1134, held that the question whether a rate yields such a return as not to be confiscatory depends upon circumstances, locality and risk, and that no proper rate can be established for all cases; and that, under the circumstances of that case, 6 per cent. was a fair return on the value of the property employed in supplying gas to the city of New York, and that a rate yielding that return was not confiscatory. In that case the investment was held to be safe, returns certain and risk reduced almost to a minimum-as nearly a safe and secure investment as could be imagined in regard to any private manufacturing enterprise.

In 1912, in Cedar Rapids Gas Co. v. Cedar Rapids, 223 U. S. 655, 670, 32 Sup. Ct. 389, 56 L. Ed. 594, this court declined to reverse the state court where the value of the plant considerably exceeded its cost, and the estimated return was over 6 per cent.

In 1915, in Des Moines Gas Co. v. Des Moines, 238 U. S. 153, 172, 35 Sup. Ct. 811, 59 L. Ed. 1244, this court declined to reverse the United States District Court in refusing an injunction upon the conclusion reached that a return of 6 per cent. per annum upon the value would not be confiscatory.

In 1919, this court in Lincoln Gas Co. v. Lincoln, 250 U. S. 256, 268, 39 Sup. Ct. 454, 458 (63 L. Ed. 968), declined on the facts of that case to approve a finding that no rate yielding as much as 6 per cent. ***694** on the invested capital could be regarded as confiscatory. Speaking for the court, Mr. Justice Pitney said:
'It is a matter of common knowledge that, owing principally to the World War, the costs of labor and supplies of every kind have greatly advanced since the ordinance was adopted, and largely since this cause was last heard in the court below. And it is equally well known that annual returns upon capital and enterprise the world over have materially increased, so that what would have been a proper rate of return for capital invested in gas plants and similar public utilities a few years ago furnishes no safe criterion for the present or for the future.'

In 1921, in Brush Electric Co. v. Galveston, the United States District Court held 8 per cent. a fair rate of return. FN4

FN4 This case was affirmed by this court June 4, 1923, 262 U. S. 443, 43 Sup. Ct. 606, 67 L. Ed. 1076.

In January, 1923, in City of Minneapolis v. Rand, the Circuit Court of Appeals of the Eighth Circuit (285 Fed. 818, 830) sustained, as against the attack of the city on the ground that it was excessive, 7 1/2 per cent., found by a special master and approved by the District Court as a fair and reasonable return on the capital investment-the value of the property.

[7] Investors take into account the result of past operations, especially in recent years, when determining the terms upon which they will invest in such an undertaking. Low, uncertain, or irregular income makes for low prices for the securities of the utility and higher rates of interest to be demanded by investors. The fact that the company may not insist as a matter of constitutional right that past losses be made up by rates to be applied in the present and future tends to weaken credit, and the fact that the utility is protected against being compelled to serve for confiscatory rates tends to support it. In ***695** this case the record shows that the rate of return has been low through a long period up to the time of the inquiry by the commission here involved. For example, the average rate of return on the total cost of the property from 1895 to 1915, inclusive, was less than 5 per cent.; from 1911 to 1915, inclusive, about 4.4 per cent., without allowance for depreciation. In 1919 the net operating income was approximately $24,700, leaving $15,500, approximately, or 3.4 per cent. on $460,000 fixed by the commission, after deducting 2 per cent. for depreciation. In 1920, the net operating income was approximately $25,465, leaving $16,265 for return, after allowing for depreciation. Under the facts and circumstances indicated by the record, we think that a rate of return of 6 per cent. upon the value of the property is substantially too low to constitute just compensation for the use of the property employed to render the service.

The judgment of the Supreme Court of Appeals of West Virginia is reversed.

Mr. Justice BRANDEIS concurs in the judgment of reversal, for the reasons stated by him in Missouri ex rel. Southwestern Bell Telephone Co. v. Public Service Commission of Missouri, supra.
U.S. 1923
Bluefield Waterworks & Imp. Co. v. Public Service Commission of W. Va.
P.U.R. 1923D 11, 262 U.S. 679, 43 S.Ct. 675, 67 L.Ed. 1176

(Cite as: P.U.R. 1923D 11, 43 S.Ct. 675)

END OF DOCUMENT

REQUEST: **Reference the Predictive Risk Premium Model (PRPM)**

a. Do any other rate of return experts, beyond Mr. D'Ascendis's Scott Madden colleagues, use the PRPM methodology to estimate the cost of equity? If so, please provide a table of examples containing the following fields:
    i. State
    ii. Utility
    iii. Docket number
    iv. Rate of return expert name

b. Is the PRPM used to estimate the cost of equity or expected equity returns in any context other than utility regulatory proceedings? If so, please provide evidence of such use, e.g., articles, academic papers, analyst reports, textbooks, etc.

c. Please provide historical spot variance and GARCH coefficient data like that provided in DOE 4-2 Attachment 1, updated through 2020M09, for each member of the Utility Peer Group.

d. The PRPM-based risk premium is estimated differently in different parts of the analysis:

- Utility Proxy Group (DWD-4, p. 2): average of long-term and spot, using each company's stock returns and the long-term risk-free rate
- Total market approach (DWD-4, p. 2): long-term only, using each company's stock returns and the long-term risk-free rate
- Utility Proxy Group (DWD-4, p. 2): long-term only, using large company stock returns and A3/A2-rated bonds
- Utility Proxy Group (DWD-4, p. 2): long-term only, using utility index returns and A2-rated public utility bonds
- CAPM/ECAPM market risk premium: long-term only, using large company stock returns and the long-term risk-free rate

i. Please confirm that different estimation methods are used as described above.
ii. Please explain why different methods are used in each of these analyses.

e. The Michelfelder and Ahern papers (OCA 1-12, Attachments 1 and 2) each describe their risk premium estimation methodologies as follows:

- Ahern (p. 273):

  To test the stability of the predicted risk premia over time, the predicted risk premia were calculated using either the predicted variance over each entire time period or the last monthly (spot) predicted variance. Table 3 presents the mean predicted risk premia, the range of predicted premia and the standard deviations for each time period. It is clear from the results that the risk premia are more stable over the rolling 24 month period when calculated using the average predicted variance compared with using the spot variance. Secondly, the 20 and 79 year means are substantially more stable and reasonable in magnitude than the 5 year means.

  Next, given the lessons from the analyses above, we apply the model to mechanically estimate the cost of common equity for 8 utility companies using the model … **[Using spot or long-term variance?]**

- Michelfelder (p. 86):

  First, predicted volatility, i.e., risk, is derived based upon previous volatility plus previous prediction error, because volatility is highly predictable and correlated over time. Second, the predicted volatility **[Spot or long-term? Volatility (standard deviation) or variance?]** can then be used to generate the predicted equity risk premium (ERP) by multiplying it by the GARCH coefficient, i.e., the slope of the predicted volatility.

i. Do the authors use long-term only, spot only, the average, or some other weighting?
ii. How do Mr. D'Ascendis's methods (long-term only, average of long-term and spot) compare to those used in the Michelfelder and Ahern papers?
iii. Please explain any differences between the methods used in the papers and those in Mr. D'Ascendis's analyses.

RESPONSE:

a. While Mr. D'Ascendis has not conducted comprehensive research, please see a partial list of non-ScottMadden employees that have used the PRPM in rate cases:

State	Utility	Docket No.	Name
Maine	Emera Maine	2017-00198	John E. Perkins
Maryland	Washington Gas	9322	Frank J. Hanley
Washington DC	Washington Gas	1093	Frank J. Hanley

b. In "Treasury Bond risk and return, the implications for the hedging of consumption and lessons for asset pricing", published in the Journal of Economics and Business, (attached as DOE 5-17 Attachment 1)Michelfelder and Pilotte state:

> **The beauty of the general consumption-based model is that it provides a simple and straightforward test of the hedging effectiveness of any asset that requires only modeling the first two moments of the asset's return. The test does not require consumption data, nor does it require that the researcher choose a specific model of investor preferences. The model's predictions regarding the first two moments of returns hold for any asset, for any two periods of a multi-period model, and require no assumptions regarding complete markets, return distributions, time- or state-separable utility, or the existence of labor income or human capital.[1]**

The PRPM has been published six times in peer-reviewed academic journals:

1. Pilotte, Eugene, A and Michelfelder, Richard A., *Treasury Bond Risk and Return, the Implications for the Hedging of Consumption and Lessons for Asset Pricing*, Journal of Economics and Business, June 2011, 582-604

2. Michelfelder, Richard A., *Empirical Analysis of the Generalized Consumption Asset Pricing Model: Estimating the Cost of Capital*, Journal

[1] R.A. Michelfelder, E.A Pilotte, "Treasury Bond risk and return, the implications for the hedging of consumption and lessons for asset pricing", Journal of Economics and Business, 63 (2011), 582-604

of Economics and Business, April 2015, 37-50 (attached as DOE 5-17 Attachment 2)

3. Pauline M. Ahern, Frank J. Hanley, and Richard A. Michelfelder, *New Approach to Estimating the Equity Risk Premium for Public Utilities*, The Journal of Regulatory Economics, December 2011, at 40:261-278 (attached as DOE 5-17 Attachment 3)

4. Richard A. Michelfelder, Pauline M. Ahern, Dylan W. D'Ascendis, and Frank J. Hanley, *Comparative Evaluation of the Predictive Risk Premium Model, the Discounted Cash Flow Model and the Capital Asset Pricing Model for Estimating the Cost of Common Equity,* The Electricity Journal, April 2013, at 84-89 (attached as DOE 5-17 Attachment 4)

5. Richard A. Michelfelder, Pauline M. Ahern, and Dylan W. D'Ascendis, *Decoupling, Risk Impacts and the Cost of Capital*, The Electricity Journal, January 2020 (attached as DOE 5-17 Attachment 5)

6. Richard A. Michelfelder, Pauline M. Ahern, and Dylan W. D'Ascendis, *Decoupling Impact and Public Utility Conservation Investment*, *Energy Policy*, April 2019, 311-319 (attached as DOE 5-17 Attachment 6)

Notably, none of these articles have been refuted or rebutted in the academic literature.

Additionally, the PRPM has been included in the following textbooks:

1. *Cost of Capital: Applications and Examples*, (5th Ed.), 2015, Wiley & Sons, Shannon Pratt and Roger Grabowski (editors).

2. *The Lawyer's Guide to Cost of Capital: Understanding Risk and Return for Valuing Businesses and Other Investments*, ABA Publishing, Shannon Pratt and Roger Grabowski (editors), 2015.

The PRPM is also expected to be included in Dr. Morin's next edition of New Regulatory Finance, forthcoming 2021.

c. Mr. D'Ascendis objects to this request as he does not currently possess the data and the analysis would be unduly burdensome to produce.

d. Mr. D'Ascendis estimated the following risk premiums using the PRPM in his direct analysis. While the request only references page 2, the analysis appears on the following cited pages.

i.

1. On Attachment DWD-4, page 2, Mr. D'Ascendis derived the GARCH coefficient, spot and long-term average variances using the historical individual returns of the Utility Proxy Group less the long-term risk-free rate. In this instance, he averaged the spot and long-term predicted variances to calculate individual equity risk premiums for his Utility Proxy Group companies;

2. On Attachment DWD-4, page 8, Mr. D'Ascendis derived the GARCH coefficient, spot and long-term average variances using the historical returns of the S&P 500 less the average yield on Aaa and Aa corporate bonds. In this instance, he used the long-term average variance to calculate the equity risk premium for the market less Aaa and Aa corporate bonds;

3. On Attachment DWD-4, page 12, Mr. D'Ascendis derived the GARCH coefficient, spot and long-term variances using the historical returns on the S&P Utility Index less the yield on A-rated public utility bonds to calculate the equity risk premium for the S&P Utilities Index less A-rated public utility bonds;

4. **On Attachment DWD-5, page 2, Mr. D'Ascendis derived the GARCH coefficient, spot and long-term average varainces using the historical return on the S&P 500 less the risk-free rate. In this instance, he used the long-term average variance to calculate the equity risk premium for the market less the risk-free rate for use in the CAPM;**

5. **The equity risk premium shown on Attachment DWD-7, page 5 is derived in the same manner as instance 2, above; and**

6. **The PRPM component of the average market risk premium shown on Attachment DWD-7, page 6 is calculated in the same manner as instance 4, above.**

ii. **Mr. D'Ascendis uses his professional judgment in determining whether to use the long-term average, the spot, or the average of the long-term and spot variance in determining the equity risk premium.**

e.

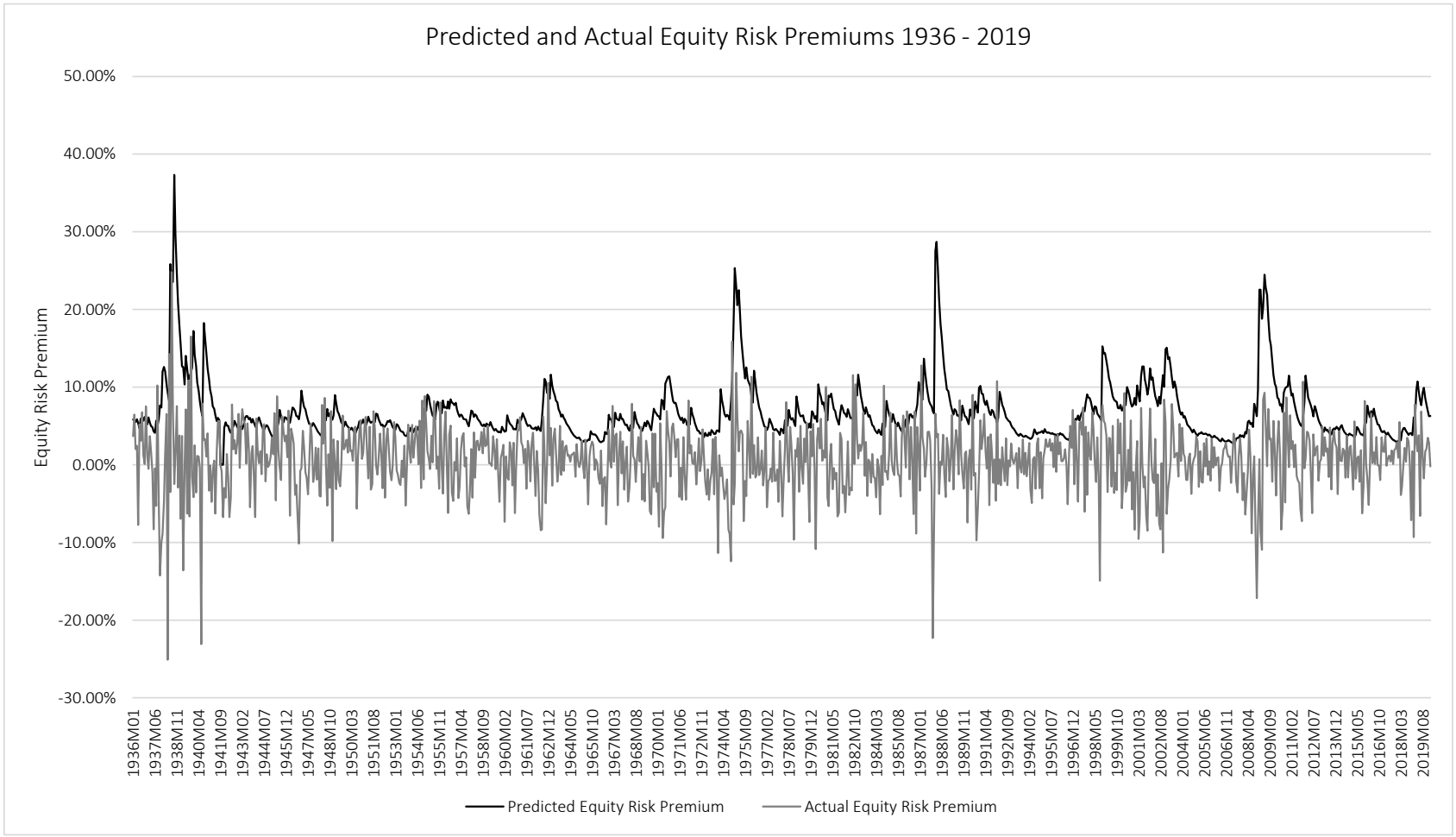
i. **As stated in the Ahern excerpt above, the authors consider both the spot and long-term variance:**

> **It is clear from the results that the risk premia are more stable over the rolling 24 month period <u>when calculated using the average predicted variance compared with using the spot variance</u>.**

ii. **Like the authors, Mr. D'Ascendis considers both the spot and average predicted variance when using the PRPM.**

iii. **Please see response to part ii, above.**

PRPM Clustering 1936 - 2019



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1973M08	0.24%		0.21%	0.32%
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1975M03	0.44%		0.35%	0.54%
1975M04	0.42%		0.31%	0.52%
1975M05	0.42%		0.28%	0.53%
1975M06	0.40%		0.27%	0.51%
1975M07	0.46%		0.26%	0.51%
1975M08	0.44%		0.24%	0.49%
1975M09	0.44%		0.24%	0.55%
1975M10	0.42%		0.23%	0.59%
1975M11	0.40%		0.22%	0.56%
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1976M02	0.44%		0.26%	0.57%
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1977M04	0.37%		0.22%	0.34%
1977M05	0.36%		0.21%	0.32%
1977M06	0.36%		0.21%	0.32%
1977M07	0.35%		0.22%	0.30%
1977M08	0.34%		0.24%	0.29%
1977M09	0.34%		0.22%	0.30%
1977M10	0.34%		0.21%	0.30%
1977M11	0.33%		0.20%	0.29%
1977M12	0.33%		0.19%	0.42%
1978M01	0.32%		0.19%	0.39%
1978M02	0.32%		0.19%	0.46%
1978M03	0.31%		0.22%	0.44%
1978M04	0.32%		0.21%	0.41%
1978M05	0.31%		0.20%	0.45%
1978M06	0.32%		0.21%	0.45%
1978M07	0.35%		0.21%	0.45%
1978M08	0.34%		0.22%	0.43%
1978M09	0.35%		0.21%	0.40%
1978M10	0.35%		0.20%	0.41%
1978M11	0.38%		0.20%	0.59%
1978M12	0.37%		0.21%	0.54%
1979M01	0.36%		0.20%	0.51%
1979M02	0.35%		0.21%	0.47%
1979M03	0.34%		0.21%	0.45%
1979M04	0.34%		0.20%	0.44%
1979M05	0.33%		0.20%	0.42%
1979M06	0.34%		0.19%	0.53%
1979M07	0.33%		0.19%	0.58%
1979M08	0.33%		0.20%	0.54%
1979M09	0.33%		0.19%	0.51%
1979M10	0.33%		0.22%	0.49%
1979M11	0.35%		0.23%	0.56%
1979M12	0.34%		0.22%	0.72%
1980M01	0.33%		0.21%	0.73%
1980M02	0.33%		0.24%	0.68%
1980M03	0.35%		0.39%	0.64%
1980M04	0.34%		0.38%	1.07%
1980M05	0.34%		0.47%	1.10%

1980M06	0.42%		0.47%	1.09%
1980M07	0.41%		0.44%	1.06%
1980M08	0.40%		0.39%	1.07%
1980M09	0.41%		0.34%	0.96%
1980M10	0.40%		0.43%	0.94%
1980M11	0.41%		0.38%	0.85%
1980M12	0.40%		0.35%	1.04%
1981M01	0.38%		0.31%	0.99%
1981M02	0.37%		0.34%	0.98%
1981M03	0.35%		0.36%	0.90%
1981M04	0.37%		0.41%	0.81%
1981M05	0.36%		0.37%	0.97%
1981M06	0.36%		0.35%	0.87%
1981M07	0.35%		0.31%	0.79%
1981M08	0.34%		0.31%	0.93%
1981M09	0.34%		0.29%	0.87%
1981M10	0.34%		0.40%	0.78%
1981M11	0.34%		0.35%	0.71%
1981M12	0.41%		0.46%	0.67%
1982M01	0.40%		0.40%	0.63%
1982M02	0.38%		0.37%	0.57%
1982M03	0.38%		0.33%	0.54%
1982M04	0.38%		0.31%	0.50%
1982M05	0.37%		0.28%	0.47%
1982M06	0.36%		0.26%	0.46%
1982M07	0.35%		0.25%	0.43%
1982M08	0.34%		0.24%	0.40%
1982M09	0.35%		0.23%	0.38%
1982M10	0.34%		0.23%	0.46%
1982M11	0.34%		0.22%	0.48%
1982M12	0.33%		0.22%	0.46%
1983M01	0.33%		0.21%	0.43%
1983M02	0.33%		0.21%	0.41%
1983M03	0.33%		0.22%	0.40%
1983M04	0.33%		0.21%	0.39%
1983M05	0.35%		0.23%	0.37%
1983M06	0.34%		0.21%	0.35%
1983M07	0.33%		0.21%	0.35%
1983M08	0.33%		0.20%	0.34%
1983M09	0.32%		0.21%	0.35%
1983M10	0.32%		0.21%	0.57%
1983M11	0.31%		0.21%	0.62%
1983M12	0.31%		0.20%	0.56%
1984M01	0.30%		0.22%	0.52%
1984M02	0.30%		0.31%	0.52%
1984M03	0.30%		0.32%	0.51%
1984M04	0.30%		0.29%	0.51%

1984M05	0.34%		0.27%	0.57%
1984M06	0.34%		0.33%	0.57%
1984M07	0.33%		0.32%	0.53%
1984M08	0.33%		0.32%	0.50%
1984M09	0.33%		0.29%	0.49%
1984M10	0.32%		0.33%	0.47%
1984M11	0.32%		0.31%	0.46%
1984M12	0.35%		0.29%	0.42%
1985M01	0.34%		0.38%	0.42%
1985M02	0.34%		0.43%	0.39%
1985M03	0.33%		0.39%	0.37%
1985M04	0.50%		0.34%	0.45%
1985M05	0.47%		0.42%	0.41%
1985M06	0.45%		0.46%	0.40%
1985M07	0.43%		0.40%	0.38%
1985M08	0.45%		0.35%	0.48%
1985M09	0.46%		0.31%	0.49%
1985M10	0.44%		0.30%	0.45%
1985M11	0.42%		0.28%	0.42%
1985M12	0.40%		0.26%	0.40%
1986M01	0.39%		0.28%	0.37%
1986M02	0.38%		0.27%	0.35%
1986M03	0.37%		0.26%	0.34%
1986M04	0.36%		0.25%	0.34%
1986M05	0.35%		0.25%	0.34%
1986M06	0.36%		0.23%	0.32%
1986M07	0.54%		0.29%	0.30%
1986M08	0.51%		0.30%	0.30%
1986M09	0.48%		0.28%	0.67%
1986M10	0.49%		0.28%	0.75%
1986M11	0.46%		0.26%	0.81%
1986M12	0.44%		0.24%	0.73%
1987M01	0.47%		0.25%	0.71%
1987M02	0.45%		0.26%	0.65%
1987M03	0.42%		0.24%	0.60%
1987M04	0.41%		0.22%	0.56%
1987M05	0.41%		0.22%	0.56%
1987M06	0.40%		0.27%	0.53%
1987M07	0.38%		0.26%	0.48%
1987M08	0.37%		0.36%	0.47%
1987M09	0.36%		0.32%	0.44%
1987M10	0.36%		0.29%	0.42%
1987M11	0.39%		0.42%	0.49%
1987M12	0.39%		0.70%	0.49%
1988M01	0.40%		0.60%	0.46%
1988M02	0.47%		0.51%	0.42%
1988M03	0.46%		0.48%	0.52%

1988M04	0.43%		0.42%	0.49%
1988M05	0.42%		0.38%	0.48%
1988M06	0.41%		0.48%	0.47%
1988M07	0.39%		0.51%	0.45%
1988M08	0.39%		0.47%	0.44%
1988M09	0.37%		0.43%	0.45%
1988M10	0.37%		0.37%	0.42%
1988M11	0.36%		0.36%	0.39%
1988M12	0.35%		0.35%	0.40%
1989M01	0.34%		0.31%	0.38%
1989M02	0.33%		0.28%	0.35%
1989M03	0.33%		0.29%	0.34%
1989M04	0.33%		0.27%	0.33%
1989M05	0.33%		0.26%	0.31%
1989M06	0.34%		0.24%	0.30%
1989M07	0.33%		0.24%	0.28%
1989M08	0.32%		0.31%	0.27%
1989M09	0.33%		0.29%	0.29%
1989M10	0.33%		0.28%	0.30%
1989M11	0.32%		0.26%	0.30%
1989M12	0.32%		0.24%	0.30%
1990M01	0.33%		0.23%	0.29%
1990M02	0.33%		0.22%	0.27%
1990M03	0.32%		0.22%	0.27%
1990M04	0.32%		0.28%	0.26%
1990M05	0.34%		0.26%	0.30%
1990M06	0.34%		0.24%	0.32%
1990M07	0.35%		0.24%	0.32%
1990M08	0.35%		0.22%	0.33%
1990M09	0.34%		0.21%	0.37%
1990M10	0.36%		0.23%	0.41%
1990M11	0.35%		0.24%	0.47%
1990M12	0.34%		0.23%	0.44%
1991M01	0.33%		0.22%	0.41%
1991M02	0.32%		0.26%	0.39%
1991M03	0.34%		0.25%	0.42%
1991M04	0.33%		0.39%	0.39%
1991M05	0.33%		0.35%	0.37%
1991M06	0.32%		0.32%	0.35%
1991M07	0.33%		0.41%	0.33%
1991M08	0.35%		0.38%	0.31%
1991M09	0.34%		0.43%	0.32%
1991M10	0.33%		0.41%	0.30%
1991M11	0.34%		0.36%	0.32%
1991M12	0.33%		0.34%	0.32%
1992M01	0.33%		0.30%	0.30%
1992M02	0.33%		0.28%	0.30%

1992M03	0.33%		0.32%	0.29%
1992M04	0.33%		0.31%	0.29%
1992M05	0.33%		0.29%	0.29%
1992M06	0.33%		0.29%	0.28%
1992M07	0.32%		0.29%	0.26%
1992M08	0.32%		0.35%	0.34%
1992M09	0.33%		0.34%	0.34%
1992M10	0.33%		0.31%	0.33%
1992M11	0.32%		0.28%	0.32%
1992M12	0.32%		0.29%	0.30%
1993M01	0.31%		0.27%	0.29%
1993M02	0.31%		0.29%	0.28%
1993M03	0.31%		0.27%	0.30%
1993M04	0.31%		0.25%	0.30%
1993M05	0.33%		0.23%	0.30%
1993M06	0.32%		0.23%	0.28%
1993M07	0.33%		0.21%	0.27%
1993M08	0.33%		0.24%	0.27%
1993M09	0.35%		0.26%	0.27%
1993M10	0.34%		0.31%	0.26%
1993M11	0.34%		0.31%	0.26%
1993M12	0.33%		0.30%	0.30%
1994M01	0.34%		0.27%	0.29%
1994M02	0.40%		0.27%	0.28%
1994M03	0.41%		0.36%	0.27%
1994M04	0.40%		0.32%	0.29%
1994M05	0.40%		0.29%	0.28%
1994M06	0.40%		0.26%	0.27%
1994M07	0.38%		0.24%	0.26%
1994M08	0.38%		0.23%	0.25%
1994M09	0.36%		0.22%	0.25%
1994M10	0.37%		0.25%	0.25%
1994M11	0.38%		0.25%	0.27%
1994M12	0.37%		0.24%	0.26%
1995M01	0.39%		0.23%	0.25%
1995M02	0.37%		0.23%	0.24%
1995M03	0.36%		0.22%	0.24%
1995M04	0.38%		0.27%	0.24%
1995M05	0.37%		0.30%	0.23%
1995M06	0.39%		0.27%	0.22%
1995M07	0.38%		0.26%	0.22%
1995M08	0.38%		0.25%	0.23%
1995M09	0.37%		0.23%	0.23%
1995M10	0.36%		0.25%	0.22%
1995M11	0.35%		0.23%	0.24%
1995M12	0.34%		0.22%	0.23%
1996M01	0.34%		0.21%	0.26%

1996M02	0.34%		0.29%	0.25%
1996M03	0.36%		0.27%	0.26%
1996M04	0.37%		0.25%	0.26%
1996M05	0.36%		0.23%	0.25%
1996M06	0.35%		0.22%	0.26%
1996M07	0.34%		0.21%	0.25%
1996M08	0.40%		0.24%	0.25%
1996M09	0.45%		0.29%	0.25%
1996M10	0.43%		0.29%	0.24%
1996M11	0.43%		0.27%	0.24%
1996M12	0.43%		0.26%	0.30%
1997M01	0.44%		0.28%	0.31%
1997M02	0.42%		0.26%	0.30%
1997M03	0.40%		0.24%	0.28%
1997M04	0.39%		0.29%	0.68%
1997M05	0.38%		0.39%	1.12%
1997M06	0.38%		0.36%	1.05%
1997M07	0.38%		0.34%	0.94%
1997M08	0.39%		0.31%	0.85%
1997M09	0.38%		0.33%	1.05%
1997M10	0.37%		0.32%	1.01%
1997M11	0.36%		0.29%	0.91%
1997M12	0.35%		0.31%	0.87%
1998M01	0.38%		0.37%	0.97%
1998M02	0.37%		0.33%	0.88%
1998M03	0.35%		0.30%	0.82%
1998M04	0.34%		0.40%	0.75%
1998M05	0.39%		0.35%	0.70%
1998M06	0.39%		0.66%	0.68%
1998M07	0.57%		0.69%	0.68%
1998M08	0.57%		0.64%	0.63%
1998M09	0.54%		0.61%	0.81%
1998M10	0.55%		0.52%	0.74%
1998M11	0.52%		0.72%	0.75%
1998M12	0.51%		0.61%	0.68%
1999M01	0.48%		0.87%	0.78%
1999M02	0.46%		1.05%	0.90%
1999M03	0.44%		0.94%	1.02%
1999M04	0.50%		0.78%	0.92%
1999M05	0.48%		0.70%	0.84%
1999M06	0.46%		0.73%	0.77%
1999M07	0.44%		0.61%	0.70%
1999M08	0.43%		0.55%	0.64%
1999M09	0.52%		0.51%	0.58%
1999M10	0.50%		0.53%	0.53%
1999M11	0.47%		0.49%	0.50%
1999M12	0.49%		0.48%	0.46%

2000M01	0.47%		0.44%	0.53%
2000M02	0.48%		0.55%	0.51%
2000M03	0.59%		0.47%	0.52%
2000M04	0.58%		0.68%	0.49%
2000M05	0.54%		0.58%	1.15%
2000M06	0.50%		0.49%	1.03%
2000M07	0.47%		0.43%	1.22%
2000M08	0.45%		0.38%	1.11%
2000M09	0.49%		0.41%	1.00%
2000M10	0.55%		0.36%	0.91%
2000M11	0.51%		0.32%	0.82%
2000M12	0.50%		0.29%	0.74%
2001M01	0.49%		0.26%	1.28%
2001M02	0.56%		0.39%	1.35%
2001M03	0.53%		0.35%	1.23%
2001M04	0.51%		0.60%	1.10%
2001M05	0.48%		0.62%	0.99%
2001M06	0.48%		0.56%	0.91%
2001M07	0.49%		0.48%	0.88%
2001M08	0.46%		0.46%	0.80%
2001M09	0.47%		0.45%	0.75%
2001M10	0.45%		0.40%	0.71%
2001M11	0.47%		0.40%	0.68%
2001M12	0.46%		0.36%	0.63%
2002M01	0.44%		0.34%	0.62%
2002M02	0.42%		0.35%	0.56%
2002M03	0.41%		0.31%	0.52%
2002M04	0.39%		0.29%	0.48%
2002M05	0.40%		0.28%	0.44%
2002M06	0.39%		0.27%	0.58%
2002M07	0.38%		0.27%	0.54%
2002M08	0.49%		0.27%	0.50%
2002M09	0.49%		0.27%	0.49%
2002M10	0.48%		0.25%	0.48%
2002M11	0.46%		0.23%	0.45%
2002M12	0.48%		0.22%	0.46%
2003M01	0.46%		0.29%	0.43%
2003M02	0.44%		0.26%	0.41%
2003M03	0.42%		0.27%	0.39%
2003M04	0.40%		0.24%	0.37%
2003M05	0.40%		0.27%	0.35%
2003M06	0.38%		0.25%	0.34%
2003M07	0.38%		0.24%	0.32%
2003M08	0.37%		0.22%	0.31%
2003M09	0.38%		0.33%	0.30%
2003M10	0.38%		0.29%	0.28%
2003M11	0.37%		0.30%	0.28%

2003M12	0.36%		0.30%	0.42%
2004M01	0.35%		0.29%	0.39%
2004M02	0.34%		0.27%	0.37%
2004M03	0.34%		0.26%	0.35%
2004M04	0.33%		0.27%	0.33%
2004M05	0.34%		0.24%	0.34%
2004M06	0.33%		0.23%	0.33%
2004M07	0.32%		0.23%	0.31%
2004M08	0.32%		0.22%	0.31%
2004M09	0.34%		0.23%	0.34%
2004M10	0.33%		0.22%	0.33%
2004M11	0.32%		0.21%	0.32%
2004M12	0.33%		0.56%	0.35%
2005M01	0.32%		0.52%	0.33%
2005M02	0.32%		0.68%	0.32%
2005M03	0.32%		0.59%	0.31%
2005M04	0.34%		0.52%	0.29%
2005M05	0.33%		0.45%	0.33%
2005M06	0.36%		0.46%	0.32%
2005M07	0.36%		0.40%	0.35%
2005M08	0.35%		0.44%	0.36%
2005M09	0.35%		0.41%	0.37%
2005M10	0.34%		0.36%	0.41%
2005M11	0.35%		0.53%	0.49%
2005M12	0.35%		0.46%	0.50%
2006M01	0.34%		0.44%	0.47%
2006M02	0.33%		0.48%	0.44%
2006M03	0.35%		0.42%	0.41%
2006M04	0.36%		0.37%	0.39%
2006M05	0.36%		0.37%	0.54%
2006M06	0.38%		0.48%	0.50%
2006M07	0.37%		0.45%	0.48%
2006M08	0.37%		0.39%	0.47%
2006M09	0.36%		0.36%	0.47%
2006M10	0.35%		0.33%	0.49%
2006M11	0.37%		0.32%	0.52%
2006M12	0.40%		0.30%	0.48%
2007M01	0.39%		0.27%	0.47%
2007M02	0.37%		0.26%	0.44%
2007M03	0.37%		0.25%	0.41%
2007M04	0.36%		0.23%	0.39%
2007M05	0.36%		0.22%	0.37%
2007M06	0.34%		0.23%	0.35%
2007M07	0.34%		0.21%	0.34%
2007M08	0.33%		0.21%	0.33%
2007M09	0.34%		0.22%	0.37%
2007M10	0.33%		0.21%	0.38%

2007M11	0.41%		0.42%	0.35%
2007M12	0.42%		0.52%	0.35%
2008M01	0.45%		0.49%	0.35%
2008M02	0.46%		0.47%	0.37%
2008M03	0.45%		0.46%	0.37%
2008M04	0.46%		0.39%	0.35%
2008M05	0.44%	0.72%	0.35%	0.33%
2008M06	0.42%	0.69%	0.35%	0.36%
2008M07	0.41%	0.66%	0.43%	0.38%
2008M08	0.39%	0.56%	0.52%	0.36%
2008M09	0.41%	0.47%	0.48%	0.50%
2008M10	0.39%	0.43%	0.42%	0.48%
2008M11	0.43%	0.40%	0.38%	0.44%
2008M12	0.41%	0.39%	0.48%	0.70%
2009M01	0.41%	0.38%	0.48%	0.67%
2009M02	0.40%	0.38%	0.47%	0.61%
2009M03	0.39%	0.32%	0.51%	0.67%
2009M04	0.39%	0.32%	0.47%	0.64%
2009M05	0.39%	0.29%	0.47%	0.66%
2009M06	0.41%	0.29%	0.53%	0.69%
2009M07	0.42%	0.27%	0.48%	0.66%
2009M08	0.41%	0.27%	0.41%	0.60%
2009M09	0.43%	0.27%	0.37%	0.59%
2009M10	0.43%	0.26%	0.34%	0.55%
2009M11	0.44%	0.25%	0.35%	0.65%
2009M12	0.42%	0.19%	0.31%	0.60%
2010M01	0.42%	0.19%	0.28%	0.57%
2010M02	0.42%	0.19%	0.26%	0.56%
2010M03	0.40%	0.20%	0.24%	0.52%
2010M04	0.40%	0.20%	0.24%	0.48%
2010M05	0.40%	0.20%	0.23%	0.45%
2010M06	0.41%	0.19%	0.27%	0.43%
2010M07	0.40%	0.20%	0.25%	0.40%
2010M08	0.39%	0.20%	0.24%	0.43%
2010M09	0.39%	0.20%	0.22%	0.40%
2010M10	0.39%	0.20%	0.24%	0.38%
2010M11	0.38%	0.21%	0.23%	0.37%
2010M12	0.37%	0.21%	0.21%	0.34%
2011M01	0.37%	0.21%	0.20%	0.33%
2011M02	0.36%	0.22%	0.20%	0.32%
2011M03	0.35%	0.20%	2.06E-03	0.31%
2011M04	0.36%	0.21%	2.19E-03	0.29%
2011M05	0.35%	0.21%	2.08E-03	0.28%
2011M06	0.34%	0.21%	1.99E-03	0.27%
2011M07	0.33%	0.21%	1.95E-03	0.27%
2011M08	0.33%	0.21%	1.96E-03	0.28%
2011M09	0.33%	0.20%	2.01E-03	0.28%

2011M10	0.33%	0.21%	2.40E-03	0.27%
2011M11	0.32%	0.21%	2.42E-03	0.26%
2011M12	0.32%	0.21%	2.26E-03	0.26%
2012M01	0.31%	0.22%	2.16E-03	0.25%
2012M02	0.31%	0.22%	2.05E-03	0.24%
2012M03	0.31%	0.22%	2.16E-03	0.23%
2012M04	0.31%	0.22%	2.40E-03	0.23%
2012M05	0.30%	0.22%	2.26E-03	0.22%
2012M06	0.30%	0.23%	2.26E-03	0.22%
2012M07	0.32%	0.23%	0.24%	0.25%
2012M08	0.34%	0.22%	0.23%	0.25%
2012M09	0.33%	0.23%	2.15E-03	0.24%
2012M10	0.47%	0.23%	2.06E-03	0.25%
2012M11	0.45%	0.23%	2.01E-03	0.25%
2012M12	0.43%	0.23%	1.97E-03	0.24%
2013M01	0.41%	0.23%	1.92E-03	0.23%
2013M02	0.40%	0.23%	2.19E-03	0.26%
2013M03	0.39%	0.23%	2.17E-03	0.28%
2013M04	0.40%	0.23%	0.21%	0.31%
2013M05	0.39%	0.23%	1.99E-03	0.29%
2013M06	0.38%	0.23%	0.19%	0.28%
2013M07	0.37%	0.23%	0.19%	0.27%
2013M08	0.49%	0.23%	0.31%	0.30%
2013M09	0.59%	0.23%	0.36%	0.37%
2013M10	0.55%	0.23%	0.32%	0.35%
2013M11	0.51%	0.23%	0.33%	0.33%
2013M12	0.48%	0.23%	0.31%	0.32%
2014M01	0.46%	0.23%	2.83E-03	0.31%
2014M02	0.44%	0.24%	2.58E-03	0.30%
2014M03	0.43%	0.23%	0.24%	0.29%
2014M04	0.42%	0.24%	0.22%	0.28%
2014M05	0.42%	0.24%	2.58E-03	0.27%
2014M06	0.40%	0.23%	0.24%	0.26%
2014M07	0.41%	0.23%	0.31%	0.25%
2014M08	0.43%	0.23%	0.33%	0.32%
2014M09	0.42%	0.23%	0.34%	0.32%
2014M10	0.41%	0.22%	0.38%	0.34%
2014M11	0.50%	0.20%	0.57%	0.40%
2014M12	0.47%	0.20%	0.50%	0.37%
2015M01	0.46%	0.21%	0.44%	0.35%
2015M02	0.44%	0.21%	0.38%	0.33%
2015M03	0.42%	0.21%	0.35%	0.31%
2015M04	0.40%	0.21%	0.33%	0.30%
2015M05	0.39%	0.21%	0.31%	0.28%
2015M06	0.38%	0.21%	0.28%	0.27%
2015M07	0.37%	0.20%	0.28%	0.31%
2015M08	0.36%	0.19%	3.00E-03	0.30%

2015M09	0.35%	0.20%	2.89E-03	0.28%
2015M10	0.37%	0.20%	0.31%	0.28%
2015M11	0.36%	0.20%	0.28%	0.31%
2015M12	0.35%	0.20%	0.25%	0.29%
2016M01	0.34%	0.21%	0.24%	0.28%
2016M02	0.35%	0.20%	0.28%	0.29%
2016M03	0.36%	0.20%	0.26%	0.28%
2016M04	0.37%	0.20%	0.29%	0.28%
2016M05	0.37%	0.20%	0.28%	0.27%
2016M06	0.37%	0.21%	0.27%	0.26%
2016M07	0.41%	0.17%	0.63%	0.32%
2016M08	0.39%	0.17%	0.55%	0.31%
2016M09	0.42%	0.15%	0.58%	0.41%
2016M10	0.40%	0.16%	0.51%	0.38%
2016M11	0.38%	0.16%	0.46%	0.36%
2016M12	0.38%	0.17%	0.52%	0.34%
2017M01	0.38%	0.17%	0.45%	0.32%
2017M02	0.38%	0.18%	0.39%	0.31%
2017M03	0.36%	0.18%	0.38%	0.30%
2017M04	0.35%	0.18%	0.35%	0.29%
2017M05	0.34%	0.19%	0.31%	0.28%
2017M06	0.34%	0.19%	0.29%	0.27%
2017M07	0.33%	0.20%	0.30%	0.26%
2017M08	0.33%	0.20%	0.29%	0.25%
2017M09	0.32%	0.20%	0.28%	0.24%
2017M10	0.32%	0.21%	0.26%	0.23%
2017M11	0.34%	0.20%	0.33%	0.25%
2017M12	0.35%	0.20%	0.36%	0.28%
2018M01	0.34%	0.20%	0.32%	0.27%
2018M02	0.34%	0.18%	0.42%	0.32%
2018M03	0.34%	0.18%	0.42%	0.32%
2018M04	0.33%	0.18%	0.37%	0.31%
2018M05	0.33%	0.19%	0.34%	0.30%
2018M06	0.32%	0.19%	0.31%	0.28%
2018M07	0.32%	0.19%	0.30%	0.27%
2018M08	0.32%	0.19%	0.29%	0.27%
2018M09	0.31%	0.20%	0.27%	0.26%
2018M10	0.31%	0.20%	0.26%	0.25%
2018M11	0.31%	0.21%	0.25%	0.36%
2018M12	0.33%	0.20%	0.30%	0.36%
2019M01	0.33%	0.19%	0.29%	0.34%
2019M02	0.32%	0.20%	0.27%	0.32%
2019M03	0.32%	0.19%	0.27%	0.31%
2019M04	0.32%	0.20%	0.26%	0.29%
2019M05	0.31%	0.20%	0.31%	0.31%
2019M06	0.31%	0.20%	0.28%	0.29%
2019M07	0.31%	0.21%	0.26%	0.29%

2019M08	0.30%	0.21%	0.27%	0.28%
2019M09	0.44%	0.19%	0.27%	0.28%
2019M10	0.42%	0.19%	0.30%	0.27%
2019M11	0.41%	0.19%	0.30%	0.26%
2019M12	0.44%	0.20%	0.34%	0.26%
2020M01	0.42%	0.20%	0.31%	0.27%
2020M02	0.40%	0.18%	0.28%	0.33%
2020M03	0.46%	0.16%	0.34%	0.54%
2020M04	0.44%	0.17%	0.32%	0.53%
2020M05	0.43%	0.17%	0.42%	0.49%
2020M06	0.41%	0.18%	0.38%	0.46%
2020M07	0.40%	0.18%	0.34%	0.44%
2020M08	0.39%	0.14%	0.31%	0.44%
2020M09	0.37%	0.15%	0.29%	0.44%
Avg Pred. Variance	0.38%	0.23%	0.32%	0.44%
Spot Variance	0.37%	0.15%	0.29%	0.44%
GARCH Coefficient	1.858272	5.95293	1.87426	2.2287

Predicted RP Based on Avg

Predicted RP Based on Spot

Predicted RP

MSEX	SJW	YORW	MKTRP	SPRP	MKTAAAAA
Last updated: Modified: 1 11	Last updated: Modified: 1 11	Last updated: Modified: 1 11	Last updated: 0 Modified: 1 113	Last updated: Modified: 1 11	Last updated: 09/ Modified: 1 1136 /
			0.13%		
			0.12%		
			0.13%		
			0.17%		
			0.16%		
			0.14%		
			0.15%		
			0.16%		
			0.14%		
			0.13%		
			0.14%		
			0.14%		
			0.13%		
			0.12%		
			0.14%		
			0.13%		
			0.12%		
			0.15%		
			0.14%		
			0.17%		
			0.18%		
			0.17%		
			0.20%		
			0.23%		
			0.20%	0.27%	0.23%
			0.18%	0.25%	0.20%
			0.17%	0.23%	0.18%
			0.28%	0.25%	0.30%
			0.25%	0.31%	0.26%
			0.22%	0.28%	0.23%
			0.22%	0.27%	0.23%
			0.20%	0.24%	0.20%
			0.24%	0.26%	0.24%
			0.21%	0.23%	0.21%
			0.19%	0.21%	0.19%
			0.35%	0.66%	0.35%
			0.30%	0.58%	0.30%
			0.29%	0.66%	0.29%
			0.25%	0.60%	0.25%
			0.22%	0.53%	0.22%
			0.19%	0.47%	0.20%
			0.20%	0.43%	0.20%

			0.32%	0.85%	0.32%
			0.29%	0.80%	0.29%
			0.35%	0.78%	0.36%
			0.35%	0.69%	0.35%
			0.87%	1.70%	0.88%
			1.03%	1.81%	1.03%
			0.86%	1.59%	0.87%
			0.73%	1.41%	0.74%
			0.62%	1.28%	0.63%
			0.57%	1.16%	0.58%
			0.49%	1.02%	0.50%
			0.42%	0.91%	0.43%
			0.76%	1.27%	0.78%
			0.64%	1.11%	0.66%
			0.54%	0.97%	0.55%
			0.74%	1.03%	0.75%
			0.77%	1.02%	0.78%
			0.67%	0.98%	0.67%
			0.67%	0.89%	0.68%
			0.57%	0.79%	0.58%
			0.61%	0.90%	0.62%
			0.62%	0.80%	0.62%
			0.69%	0.87%	0.69%
			0.87%	0.92%	0.88%
			0.89%	0.96%	0.91%
			0.88%	0.91%	0.89%
			0.74%	0.80%	0.75%
			1.94%	1.89%	1.96%
			1.62%	1.70%	1.64%
			1.57%	1.57%	1.58%
			1.77%	1.64%	1.77%
			1.56%	1.46%	1.56%
			1.30%	1.30%	1.30%
			1.40%	1.33%	1.40%
			1.93%	1.51%	1.92%
			2.60%	2.36%	2.58%
			2.25%	2.07%	2.22%
			3.09%	2.75%	3.14%
			3.63%	3.78%	3.75%
			3.28%	3.37%	3.37%
			3.43%	3.22%	3.47%
			3.12%	2.89%	3.13%
			2.60%	2.54%	2.62%
			2.23%	2.27%	2.23%
			2.62%	2.59%	2.61%
			2.20%	2.51%	2.19%
			3.44%	2.72%	3.51%

			2.89%	2.54%	2.98%
			2.42%	2.32%	2.51%
			2.34%	2.30%	2.41%
			1.97%	2.03%	2.04%
			2.02%	2.26%	2.07%
			1.96%	2.10%	1.99%
			1.66%	1.87%	1.70%
			1.39%	1.64%	1.43%
			1.21%	1.65%	1.24%
			1.07%	1.48%	1.10%
			0.91%	1.30%	0.94%
			0.80%	1.18%	0.82%
			0.80%	1.14%	0.82%
			0.67%	1.00%	0.69%
			0.80%	1.23%	0.82%
			0.69%	1.07%	0.70%
			0.59%	0.94%	0.60%
			0.53%	0.90%	0.54%
			0.52%	0.79%	0.53%
			0.44%	0.78%	0.46%
			0.42%	0.70%	0.43%
			0.39%	0.79%	0.40%
			0.35%	0.78%	0.36%
			0.40%	0.80%	0.40%
			0.35%	0.80%	0.35%
			0.34%	0.78%	0.35%
			0.36%	0.74%	0.37%
			0.31%	0.67%	0.32%
			0.27%	0.59%	0.28%
			0.29%	0.65%	0.30%
			0.27%	0.57%	0.27%
			0.24%	0.52%	0.25%
			0.25%	0.56%	0.26%
			0.22%	0.52%	0.23%
			0.20%	0.46%	0.20%
			0.26%	0.49%	0.27%
			0.26%	0.48%	0.26%
			0.23%	0.43%	0.23%
			0.25%	0.47%	0.25%
			0.22%	0.42%	0.22%
			0.19%	0.38%	0.19%
			0.23%	0.36%	0.23%
			0.20%	0.32%	0.20%
			0.18%	0.29%	0.18%
			0.17%	0.26%	0.17%
			0.16%	0.25%	0.16%
			0.14%	0.27%	0.14%

			0.23%	0.31%	0.23%
			0.20%	0.32%	0.20%
			0.22%	0.31%	0.22%
			0.31%	0.55%	0.31%
			0.31%	0.60%	0.31%
			0.56%	0.71%	0.57%
			0.65%	0.67%	0.65%
			0.70%	0.59%	0.70%
			0.65%	0.64%	0.65%
			0.55%	0.59%	0.55%
			0.49%	0.52%	0.50%
			1.32%	0.94%	1.32%
			1.23%	1.03%	1.25%
			1.09%	0.90%	1.11%
			1.50%	1.02%	1.54%
			1.26%	0.89%	1.30%
			1.10%	0.83%	1.13%
			0.92%	0.73%	0.95%
			0.80%	0.94%	0.83%
			0.71%	0.89%	0.73%
			0.60%	0.79%	0.62%
			0.60%	0.69%	0.62%
			0.51%	0.65%	0.53%
			0.73%	0.82%	0.74%
			0.62%	0.72%	0.63%
			0.56%	0.66%	0.57%
			0.55%	0.61%	0.56%
			0.58%	0.67%	0.59%
			0.58%	0.65%	0.59%
			0.76%	0.58%	0.78%
			0.66%	0.51%	0.67%
			0.60%	0.46%	0.62%
			0.51%	0.41%	0.52%
			0.47%	0.36%	0.47%
			0.40%	0.32%	0.40%
			0.34%	0.28%	0.35%
			0.29%	0.26%	0.30%
			0.98%	0.68%	1.00%
			0.85%	0.80%	0.87%
			0.72%	0.70%	0.73%
			0.60%	0.62%	0.62%
			0.51%	0.56%	0.52%
			0.44%	0.49%	0.45%
			0.40%	0.62%	0.41%
			0.35%	0.55%	0.35%
			0.34%	0.48%	0.35%
			0.30%	0.44%	0.30%

			0.26%	0.40%	0.26%
			0.29%	0.45%	0.29%
			0.25%	0.42%	0.25%
			0.25%	0.37%	0.25%
			0.25%	0.35%	0.25%
			0.22%	0.32%	0.22%
			0.19%	0.30%	0.19%
			0.24%	0.35%	0.24%
			0.23%	0.37%	0.23%
			0.23%	0.39%	0.23%
			0.20%	0.35%	0.20%
			0.18%	0.33%	0.19%
			0.23%	0.43%	0.23%
			0.23%	0.41%	0.23%
			0.27%	0.44%	0.27%
			0.23%	0.39%	0.24%
			0.21%	0.34%	0.21%
			0.19%	0.30%	0.19%
			0.17%	0.29%	0.17%
			0.20%	0.44%	0.20%
			0.18%	0.39%	0.18%
			0.19%	0.35%	0.19%
			0.22%	0.45%	0.22%
			0.23%	0.44%	0.23%
			0.22%	0.40%	0.23%
			0.20%	0.36%	0.20%
			0.20%	0.33%	0.20%
			0.18%	0.31%	0.18%
			0.21%	0.28%	0.21%
			0.18%	0.25%	0.18%
			0.17%	0.23%	0.17%
			0.15%	0.20%	0.15%
			0.20%	0.26%	0.20%
			0.22%	0.26%	0.22%
			0.19%	0.23%	0.19%
			0.17%	0.21%	0.17%
			0.15%	0.19%	0.15%
			0.14%	0.17%	0.14%
			0.15%	0.16%	0.15%
			0.17%	0.17%	0.17%
			0.16%	0.15%	0.16%
			0.14%	0.15%	0.14%
			0.13%	0.14%	0.13%
			0.12%	0.13%	0.12%
			0.11%	0.12%	0.11%
			0.12%	0.12%	0.12%
			0.11%	0.13%	0.11%

			0.15%	0.16%	0.15%
			0.17%	0.17%	0.17%
			0.24%	0.26%	0.24%
			0.21%	0.24%	0.21%
			0.19%	0.25%	0.19%
			0.17%	0.22%	0.17%
			0.20%	0.20%	0.20%
			0.19%	0.23%	0.19%
			0.18%	0.24%	0.18%
			0.17%	0.24%	0.17%
			0.15%	0.21%	0.15%
			0.19%	0.33%	0.19%
			0.23%	0.35%	0.24%
			0.22%	0.34%	0.23%
			0.21%	0.31%	0.21%
			0.19%	0.28%	0.19%
			0.19%	0.26%	0.19%
			0.18%	0.26%	0.18%
			0.23%	0.30%	0.23%
			0.35%	0.40%	0.36%
			0.31%	0.36%	0.31%
			0.27%	0.31%	0.27%
			0.25%	0.32%	0.25%
			0.22%	0.29%	0.22%
			0.20%	0.26%	0.20%
			0.18%	0.25%	0.18%
			0.18%	0.24%	0.18%
			0.16%	0.22%	0.16%
			0.18%	0.22%	0.18%
			0.17%	0.20%	0.17%
			0.16%	0.18%	0.16%
			0.15%	0.16%	0.15%
			0.14%	0.15%	0.14%
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			0.31%	0.38%	0.31%
			0.27%	0.34%	0.27%
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			0.23%	0.36%	0.23%
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	0.20%		0.12%	0.17%	0.12%
0.07%	0.21%		0.11%	0.16%	0.11%
0.09%	0.21%		0.11%	0.18%	0.11%
0.10%	0.21%		0.13%	0.17%	0.12%
0.11%	0.28%		0.12%	0.16%	0.12%
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0.21%	0.34%		0.29%	0.33%	0.29%
0.23%	0.34%		0.25%	0.30%	0.25%
0.25%	0.38%		0.23%	0.28%	0.23%
0.24%	0.40%		0.20%	0.25%	0.20%
0.23%	0.39%		0.19%	0.25%	0.19%
0.24%	0.39%		0.20%	0.44%	0.20%
0.25%	0.39%		0.20%	0.43%	0.20%
0.23%	0.41%		0.18%	0.43%	0.18%
0.26%	0.40%		0.26%	0.39%	0.26%
0.25%	0.38%		0.35%	0.45%	0.35%
0.28%	0.40%		0.53%	0.41%	0.53%
0.26%	0.43%		0.71%	0.48%	0.72%
0.24%	0.42%		0.66%	0.43%	0.67%
0.24%	0.44%		0.58%	0.38%	0.59%
0.28%	0.58%		0.62%	0.67%	0.63%
0.25%	0.56%		0.55%	0.59%	0.56%
0.23%	0.53%		0.46%	0.53%	0.47%
0.22%	0.50%		0.40%	0.48%	0.41%
0.21%	0.48%		0.36%	0.48%	0.37%
0.19%	0.46%		0.32%	0.51%	0.32%
0.18%	0.44%		0.36%	0.50%	0.37%
0.18%	0.43%		0.32%	0.45%	0.33%
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0.44%	0.37%		0.13%	0.15%	0.13%
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0.28%	0.47%		0.27%	0.15%	0.27%
0.26%	0.45%		0.24%	0.15%	0.24%
0.24%	0.44%		0.21%	0.14%	0.21%
0.23%	0.45%		0.21%	0.13%	0.21%
0.22%	0.44%		0.18%	0.12%	0.18%
0.20%	0.43%		0.17%	0.12%	0.17%
0.19%	0.41%		0.15%	0.11%	0.16%
0.20%	0.40%		0.20%	0.10%	0.21%
0.27%	0.41%		0.24%	0.13%	0.24%
0.26%	0.39%		0.22%	0.14%	0.23%
0.35%	0.39%		0.20%	0.14%	0.21%
0.32%	0.38%		0.20%	0.15%	0.21%
0.29%	0.37%		0.19%	0.14%	0.20%
0.27%	0.38%		0.23%	0.13%	0.24%
0.27%	0.38%		0.21%	0.12%	0.21%
0.37%	0.43%		0.19%	0.13%	0.20%
0.33%	0.41%		0.19%	0.13%	0.20%
0.32%	0.40%		0.19%	0.13%	0.19%
0.31%	0.45%		0.19%	0.13%	0.19%
0.35%	0.45%		0.32%	0.24%	0.32%
0.32%	0.44%		0.28%	0.22%	0.28%
0.34%	0.43%		0.35%	0.22%	0.36%
0.39%	0.43%		0.31%	0.20%	0.31%
0.38%	0.42%		0.27%	0.18%	0.27%
0.40%	0.41%		0.24%	0.17%	0.24%
0.45%	0.57%		0.21%	0.16%	0.21%
0.43%	0.56%		0.19%	0.14%	0.19%
0.38%	0.54%		0.22%	0.15%	0.22%
0.35%	0.61%		0.20%	0.14%	0.20%
0.32%	0.59%		0.18%	0.13%	0.18%
0.37%	0.57%		0.19%	0.12%	0.19%
0.33%	0.55%		0.17%	0.11%	0.17%
0.31%	0.53%		0.15%	0.12%	0.15%
0.30%	0.50%		0.14%	0.12%	0.14%
0.28%	0.49%		0.13%	0.13%	0.13%
0.33%	0.47%		0.12%	0.13%	0.12%
0.32%	0.49%		0.12%	0.13%	0.12%
0.29%	0.48%		0.14%	0.15%	0.14%
0.26%	0.46%		0.13%	0.14%	0.12%

0.26%	0.45%		0.12%	0.13%	0.11%
0.23%	0.43%		0.16%	0.13%	0.16%
0.22%	0.42%		0.15%	0.12%	0.15%
0.21%	0.47%		0.15%	0.12%	0.14%
0.27%	0.47%		0.25%	0.14%	0.25%
0.25%	0.45%		0.22%	0.13%	0.22%
0.23%	0.54%		0.20%	0.12%	0.20%
0.24%	0.52%		0.18%	0.12%	0.18%
0.24%	0.49%		0.16%	0.11%	0.16%
0.26%	0.50%		0.20%	0.10%	0.20%
0.26%	0.49%		0.17%	0.10%	0.17%
0.24%	0.48%		0.16%	0.09%	0.16%
0.54%	0.47%		0.15%	0.09%	0.15%
0.56%	0.45%		0.16%	0.11%	0.16%
0.61%	0.44%		0.14%	0.10%	0.14%
0.56%	0.42%		0.13%	0.13%	0.13%
0.48%	0.48%		0.13%	0.12%	0.13%
0.41%	0.46%		0.14%	0.15%	0.14%
0.37%	0.48%		0.14%	0.17%	0.14%
0.32%	0.46%		0.17%	0.17%	0.17%
0.29%	0.45%		0.17%	0.19%	0.17%
0.27%	0.45%		0.15%	0.17%	0.15%
0.27%	0.43%		0.19%	0.18%	0.19%
0.24%	0.42%		0.19%	0.18%	0.19%
0.27%	0.41%		0.18%	0.18%	0.18%
0.25%	0.42%		0.18%	0.19%	0.18%
0.32%	0.41%		0.16%	0.19%	0.16%
0.30%	0.40%		0.20%	0.18%	0.20%
0.44%	0.39%		0.23%	0.22%	0.23%
0.39%	0.43%		0.32%	0.37%	0.32%
0.41%	0.41%		0.29%	0.34%	0.29%
0.36%	0.40%		0.25%	0.30%	0.26%
0.41%	0.40%		0.24%	0.29%	0.24%
0.41%	0.39%		0.40%	0.34%	0.40%
0.41%	0.39%		0.35%	0.32%	0.35%
0.38%	0.38%		0.30%	0.29%	0.30%
0.48%	0.37%		0.27%	0.29%	0.27%
0.42%	0.36%		0.23%	0.26%	0.23%
0.44%	0.36%		0.22%	0.24%	0.22%
0.38%	0.37%		0.21%	0.22%	0.21%
0.34%	0.35%		0.19%	0.21%	0.19%
0.32%	0.35%		0.18%	0.19%	0.19%
0.36%	0.44%		0.83%	0.25%	0.84%
0.32%	0.43%		0.86%	0.27%	0.87%
0.36%	0.41%		0.74%	0.24%	0.75%
0.32%	0.40%		0.63%	0.33%	0.64%
0.50%	0.40%		0.53%	0.30%	0.54%

0.43%	0.42%		0.49%	0.32%	0.50%
0.41%	0.41%		0.42%	0.28%	0.42%
0.37%	0.40%		0.36%	0.26%	0.36%
0.33%	0.38%		0.32%	0.24%	0.32%
0.29%	0.37%		0.28%	0.21%	0.28%
0.30%	0.36%		0.27%	0.20%	0.28%
0.27%	0.35%		0.25%	0.19%	0.25%
0.25%	0.34%		0.22%	0.17%	0.22%
0.23%	0.34%		0.20%	0.16%	0.20%
0.21%	0.34%		0.18%	0.14%	0.18%
0.20%	0.34%		0.20%	0.15%	0.20%
0.19%	0.33%		0.20%	0.15%	0.20%
0.19%	0.33%		0.17%	0.14%	0.18%
0.19%	0.32%		0.18%	0.16%	0.18%
0.19%	0.33%		0.17%	0.17%	0.17%
0.22%	0.33%		0.15%	0.15%	0.15%
0.21%	0.32%		0.22%	0.19%	0.22%
0.20%	0.32%		0.19%	0.17%	0.19%
0.22%	0.33%		0.17%	0.16%	0.17%
0.21%	0.32%		0.17%	0.14%	0.17%
0.21%	0.32%		0.15%	0.13%	0.15%
0.20%	0.31%		0.14%	0.17%	0.14%
0.19%	0.36%		0.21%	0.24%	0.20%
0.19%	0.35%		0.18%	0.22%	0.18%
0.18%	0.34%		0.16%	0.20%	0.16%
0.19%	0.34%		0.16%	0.20%	0.16%
0.18%	0.33%		0.24%	0.22%	0.24%
0.17%	0.33%		0.21%	0.21%	0.21%
0.17%	0.33%		0.19%	0.19%	0.19%
0.17%	0.33%		0.31%	0.26%	0.31%
0.17%	0.32%		0.32%	0.24%	0.32%
0.17%	0.31%		0.28%	0.24%	0.28%
0.17%	0.31%		0.27%	0.22%	0.27%
0.17%	0.30%		0.24%	0.19%	0.24%
0.17%	0.30%		0.22%	0.19%	0.22%
0.18%	0.33%		0.24%	0.18%	0.24%
0.18%	0.32%		0.21%	0.16%	0.21%
0.18%	0.32%		0.18%	0.15%	0.19%
0.17%	0.31%		0.18%	0.15%	0.18%
0.17%	0.33%		0.20%	0.14%	0.20%
0.17%	0.33%		0.19%	0.13%	0.19%
0.18%	0.32%		0.17%	0.12%	0.17%
0.17%	0.33%		0.16%	0.11%	0.16%
0.21%	0.34%		0.15%	0.10%	0.15%
0.19%	0.33%		0.16%	0.10%	0.17%
0.23%	0.32%		0.28%	0.14%	0.28%
0.21%	0.33%		0.26%	0.17%	0.26%

0.20%	0.32%		0.22%	0.17%	0.23%
0.19%	0.32%		0.21%	0.16%	0.21%
0.19%	0.31%		0.19%	0.17%	0.19%
0.19%	0.31%		0.17%	0.16%	0.17%
0.19%	0.32%		0.16%	0.14%	0.16%
0.19%	0.33%		0.15%	0.18%	0.15%
0.18%	0.32%		0.15%	0.17%	0.15%
0.19%	0.31%		0.14%	0.15%	0.14%
0.26%	0.33%		0.12%	0.14%	0.12%
0.24%	0.34%		0.12%	0.13%	0.12%
0.27%	0.33%		0.11%	0.13%	0.11%
0.25%	0.33%		0.10%	0.12%	0.10%
0.23%	0.38%		0.10%	0.15%	0.10%
0.22%	0.37%		0.09%	0.14%	0.09%
0.22%	0.36%		0.10%	0.13%	0.10%
0.22%	0.36%		0.10%	0.12%	0.10%
0.21%	0.35%		0.10%	0.13%	0.09%
0.20%	0.34%		0.09%	0.12%	0.09%
0.23%	0.33%		0.10%	0.13%	0.10%
0.35%	0.33%		0.10%	0.12%	0.09%
0.31%	0.32%		0.09%	0.11%	0.09%
0.31%	0.32%		0.09%	0.14%	0.09%
0.30%	0.34%		0.09%	0.13%	0.09%
0.30%	0.34%		0.09%	0.12%	0.09%
0.27%	0.33%		0.10%	0.15%	0.10%
0.28%	0.33%		0.13%	0.16%	0.13%
0.50%	0.32%		0.12%	0.14%	0.12%
0.44%	0.33%		0.11%	0.15%	0.11%
0.40%	0.32%		0.12%	0.13%	0.12%
0.37%	0.32%		0.12%	0.13%	0.11%
0.39%	0.31%		0.12%	0.12%	0.12%
0.34%	0.31%		0.13%	0.12%	0.12%
0.31%	0.31%		0.12%	0.11%	0.12%
0.28%	0.30%		0.14%	0.11%	0.13%
0.41%	0.33%		0.12%	0.10%	0.12%
0.37%	0.38%		0.12%	0.14%	0.12%
0.35%	0.39%		0.12%	0.13%	0.12%
0.33%	0.40%		0.11%	0.12%	0.11%
0.30%	0.39%		0.11%	0.12%	0.11%
0.27%	0.38%		0.11%	0.12%	0.11%
0.24%	0.37%		0.11%	0.11%	0.11%
0.23%	0.36%		0.11%	0.10%	0.11%
0.21%	0.35%		0.10%	0.10%	0.10%
0.20%	0.34%		0.11%	0.12%	0.11%
0.19%	0.34%		0.11%	0.11%	0.10%
0.22%	0.34%		0.11%	0.11%	0.11%
0.21%	0.35%		0.11%	0.14%	0.10%

0.20%	0.36%		0.11%	0.13%	0.11%
0.20%	0.38%		0.10%	0.14%	0.10%
0.23%	0.37%		0.10%	0.14%	0.09%
0.25%	0.37%		0.09%	0.13%	0.09%
0.23%	0.36%		0.09%	0.12%	0.09%
0.21%	0.40%		0.09%	0.12%	0.08%
0.20%	0.43%		0.12%	0.16%	0.12%
0.19%	0.41%		0.11%	0.15%	0.11%
0.19%	0.40%		0.13%	0.14%	0.13%
0.19%	0.39%		0.12%	0.14%	0.12%
0.20%	0.41%		0.17%	0.13%	0.17%
0.19%	0.40%		0.16%	0.12%	0.16%
0.19%	0.39%		0.18%	0.11%	0.18%
0.19%	0.40%		0.16%	0.11%	0.16%
0.19%	0.39%		0.18%	0.11%	0.18%
0.21%	0.38%		0.19%	0.11%	0.19%
0.21%	0.39%		0.20%	0.11%	0.20%
0.21%	0.38%		0.19%	0.11%	0.19%
0.21%	0.37%		0.23%	0.10%	0.23%
0.26%	0.36%		0.26%	0.10%	0.26%
0.24%	0.35%		0.24%	0.11%	0.25%
0.22%	0.35%		0.24%	0.10%	0.24%
0.23%	0.34%		0.23%	0.14%	0.23%
0.60%	0.35%		0.20%	0.17%	0.20%
0.61%	0.35%		0.17%	0.18%	0.18%
0.52%	0.36%		0.21%	0.17%	0.21%
0.47%	0.41%		0.20%	0.19%	0.20%
0.41%	0.48%		0.18%	0.18%	0.18%
0.35%	0.47%		0.17%	0.16%	0.17%
0.31%	0.49%		0.16%	0.15%	0.16%
0.31%	0.48%		0.15%	0.18%	0.15%
0.29%	0.48%		0.44%	0.16%	0.44%
0.27%	0.49%		0.40%	0.21%	0.40%
0.25%	0.48%		0.39%	0.19%	0.40%
0.40%	0.48%		0.36%	0.17%	0.37%
0.37%	0.47%		0.33%	0.16%	0.34%
0.33%	0.45%		0.30%	0.18%	0.30%
0.39%	0.44%		0.28%	0.18%	0.28%
0.46%	0.46%		0.25%	0.17%	0.26%
0.52%	0.45%		0.23%	0.22%	0.23%
0.50%	0.44%		0.22%	0.23%	0.22%
0.45%	0.58%		0.21%	0.22%	0.22%
0.39%	0.55%		0.21%	0.20%	0.21%
0.61%	0.53%		0.19%	0.18%	0.19%
0.52%	0.51%		0.19%	0.20%	0.19%
0.45%	0.79%		0.20%	0.18%	0.20%
0.52%	0.74%		0.18%	0.24%	0.18%

0.54%	0.70%		0.19%	0.22%	0.19%
0.50%	0.67%		0.21%	0.30%	0.22%
0.65%	0.64%		0.20%	0.32%	0.20%
0.62%	0.61%		0.27%	0.29%	0.27%
0.53%	0.58%		0.26%	0.31%	0.26%
0.46%	0.55%		0.24%	0.29%	0.24%
0.40%	0.53%		0.21%	0.31%	0.21%
0.36%	0.51%		0.20%	0.31%	0.20%
0.34%	0.48%		0.21%	0.44%	0.21%
0.30%	0.46%		0.23%	0.46%	0.24%
0.34%	0.45%		0.21%	0.43%	0.21%
0.35%	0.44%		0.29%	0.39%	0.29%
0.53%	0.46%		0.25%	0.42%	0.25%
0.47%	0.46%	2.69%	0.22%	0.50%	0.23%
0.49%	0.65%	2.38%	0.33%	0.45%	0.34%
0.42%	0.62%	2.44%	0.36%	0.40%	0.37%
0.37%	0.59%	2.13%	0.36%	0.38%	0.36%
0.55%	0.56%	1.85%	0.31%	0.36%	0.31%
0.51%	0.54%	1.61%	0.28%	0.41%	0.29%
0.45%	0.52%	1.41%	0.25%	0.39%	0.26%
0.39%	0.49%	1.25%	0.29%	0.37%	0.30%
0.35%	0.48%	1.10%	0.36%	0.50%	0.37%
0.31%	0.46%	0.99%	0.31%	0.44%	0.32%
0.27%	0.46%	0.88%	0.32%	0.44%	0.33%
0.25%	0.45%	0.88%	0.28%	0.39%	0.28%
0.23%	0.45%	0.81%	0.25%	0.40%	0.25%
0.23%	0.43%	0.74%	0.23%	0.36%	0.23%
0.21%	0.42%	0.67%	0.21%	0.46%	0.21%
0.23%	0.41%	0.69%	0.25%	0.41%	0.25%
0.22%	0.40%	0.63%	0.22%	0.48%	0.23%
0.29%	0.39%	0.62%	0.28%	0.50%	0.29%
0.33%	0.38%	0.59%	0.35%	0.69%	0.35%
0.32%	0.38%	0.58%	0.30%	0.61%	0.31%
0.31%	0.37%	0.53%	0.45%	0.76%	0.46%
0.28%	0.36%	0.49%	0.45%	0.68%	0.45%
0.26%	0.35%	0.46%	0.40%	0.60%	0.41%
0.29%	0.35%	0.55%	0.41%	0.53%	0.42%
0.27%	0.34%	0.54%	0.38%	0.49%	0.38%
0.25%	0.33%	0.50%	0.33%	0.47%	0.34%
0.23%	0.33%	0.47%	0.29%	0.43%	0.29%
0.21%	0.35%	0.49%	0.31%	0.44%	0.31%
0.23%	0.35%	0.52%	0.29%	0.48%	0.29%
0.23%	0.34%	0.49%	0.25%	0.42%	0.25%
0.28%	0.33%	0.48%	0.22%	0.44%	0.22%
0.25%	0.32%	0.45%	0.19%	0.39%	0.19%
0.31%	0.32%	0.43%	0.18%	0.35%	0.18%
0.30%	0.32%	0.42%	0.18%	0.31%	0.19%

0.27%	0.31%	0.40%	0.16%	0.28%	0.16%
0.25%	0.30%	0.38%	0.17%	0.28%	0.17%
0.23%	0.30%	0.37%	0.15%	0.25%	0.15%
0.22%	0.43%	0.35%	0.14%	0.23%	0.14%
0.21%	0.42%	0.34%	0.13%	0.20%	0.13%
0.19%	0.41%	0.34%	0.13%	0.20%	0.13%
0.23%	0.41%	0.33%	0.12%	0.18%	0.12%
0.22%	0.40%	0.34%	0.11%	0.16%	0.11%
0.34%	0.40%	0.34%	0.12%	0.15%	0.12%
0.33%	0.40%	0.34%	0.11%	0.15%	0.11%
0.31%	0.40%	0.33%	0.11%	0.13%	0.10%
0.28%	0.38%	0.33%	0.10%	0.14%	0.10%
0.39%	0.44%	0.40%	0.11%	0.14%	0.11%
0.38%	0.44%	0.38%	0.11%	0.13%	0.11%
0.36%	0.44%	0.37%	0.12%	0.12%	0.11%
0.32%	0.43%	0.36%	0.11%	0.11%	0.11%
0.28%	0.42%	0.34%	0.11%	0.10%	0.11%
0.29%	0.42%	0.34%	0.11%	0.10%	0.11%
0.40%	0.45%	0.34%	0.11%	0.10%	0.11%
0.35%	0.47%	0.33%	0.10%	0.12%	0.10%
0.53%	0.55%	0.41%	0.11%	0.11%	0.11%
0.48%	0.57%	0.40%	0.11%	0.10%	0.10%
0.43%	0.54%	0.42%	0.10%	0.11%	0.10%
0.42%	0.52%	0.46%	0.10%	0.15%	0.10%
0.49%	0.50%	0.50%	0.11%	0.14%	0.10%
0.54%	0.53%	0.47%	0.10%	0.12%	0.10%
0.53%	0.55%	0.45%	0.10%	0.12%	0.10%
0.45%	0.52%	0.43%	0.09%	0.11%	0.09%
0.40%	0.50%	0.41%	0.09%	0.13%	0.09%
0.36%	0.49%	0.39%	0.09%	0.12%	0.08%
0.33%	0.52%	0.38%	0.10%	0.11%	0.10%
0.30%	0.55%	0.45%	0.09%	0.10%	0.09%
0.30%	0.52%	0.47%	0.09%	0.12%	0.09%
0.44%	0.58%	0.45%	0.09%	0.11%	0.09%
0.43%	0.55%	0.42%	0.09%	0.11%	0.09%
0.38%	0.57%	0.40%	0.09%	0.13%	0.09%
0.34%	0.55%	0.42%	0.09%	0.12%	0.09%
0.30%	0.55%	0.39%	0.09%	0.11%	0.08%
0.28%	0.53%	0.38%	0.09%	0.10%	0.08%
0.25%	0.58%	0.36%	0.09%	0.11%	0.09%
0.23%	0.65%	0.36%	0.09%	0.12%	0.08%
0.21%	0.70%	0.35%	0.10%	0.12%	0.10%
0.20%	0.69%	0.34%	0.10%	0.11%	0.10%
0.19%	0.65%	0.33%	0.11%	0.14%	0.10%
0.18%	0.70%	0.33%	0.12%	0.15%	0.11%
0.20%	0.78%	0.32%	0.11%	0.13%	0.11%
0.19%	0.73%	0.32%	0.11%	0.13%	0.11%

0.18%	0.69%	0.31%	0.11%	0.16%	0.10%
0.17%	0.66%	0.33%	0.13%	0.15%	0.13%
0.17%	0.63%	0.32%	0.12%	0.13%	0.12%
0.17%	0.67%	0.31%	0.17%	0.18%	0.17%
0.17%	0.63%	0.31%	0.18%	0.20%	0.18%
0.19%	0.61%	0.31%	0.16%	0.18%	0.16%
0.18%	0.59%	0.31%	0.16%	0.19%	0.16%
0.17%	0.56%	0.33%	0.15%	0.17%	0.15%
0.29%	0.63%	0.32%	0.24%	0.16%	0.24%
0.27%	0.60%	0.32%	0.22%	0.20%	0.22%
0.25%	0.58%	0.32%	0.19%	0.18%	0.19%
0.24%	0.57%	0.38%	0.29%	0.33%	0.29%
0.22%	0.56%	0.37%	0.67%	0.47%	0.68%
0.21%	0.53%	0.38%	0.68%	0.42%	0.69%
0.19%	0.52%	0.38%	0.57%	0.38%	0.58%
0.20%	0.54%	0.37%	0.62%	0.33%	0.63%
0.44%	0.60%	0.36%	0.73%	0.50%	0.75%
0.38%	0.60%	0.38%	0.66%	0.44%	0.68%
0.35%	0.57%	0.37%	0.63%	0.39%	0.64%
0.31%	0.69%	0.37%	0.54%	0.35%	0.56%
0.29%	0.69%	0.39%	0.46%	0.33%	0.48%
0.29%	0.66%	0.42%	0.44%	0.30%	0.45%
0.26%	0.62%	0.43%	0.38%	0.27%	0.39%
0.24%	0.59%	0.48%	0.33%	0.24%	0.34%
0.22%	0.57%	0.45%	0.30%	0.23%	0.30%
0.24%	0.55%	0.43%	0.28%	0.22%	0.29%
0.29%	0.53%	0.40%	0.25%	0.22%	0.25%
0.27%	0.51%	0.42%	0.24%	0.23%	0.25%
0.26%	0.49%	0.40%	0.22%	0.21%	0.22%
0.24%	0.52%	0.38%	0.22%	0.19%	0.23%
0.25%	0.51%	0.36%	0.20%	0.18%	0.20%
0.28%	0.55%	0.36%	0.27%	0.21%	0.28%
0.30%	0.53%	0.38%	0.29%	0.19%	0.29%
0.28%	0.51%	0.37%	0.30%	0.22%	0.30%
0.25%	0.51%	0.36%	0.30%	0.20%	0.30%
0.24%	0.50%	0.35%	0.33%	0.18%	0.34%
0.25%	0.48%	0.34%	0.29%	0.17%	0.30%
0.23%	0.46%	0.33%	0.26%	0.17%	0.26%
0.23%	0.45%	0.35%	0.26%	0.16%	0.26%
0.23%	0.46%	0.35%	0.23%	0.14%	0.23%
0.25%	0.44%	0.34%	0.21%	0.13%	0.21%
0.24%	0.45%	0.33%	0.19%	0.12%	0.19%
0.23%	0.43%	0.32%	0.17%	0.12%	0.17%
0.21%	0.41%	0.31%	0.16%	0.11%	0.16%
0.20%	0.40%	0.32%	0.15%	0.10%	0.15%
0.20%	0.39%	0.32%	0.14%	0.10%	0.14%
0.18%	0.38%	0.31%	0.18%	0.09%	0.18%

0.22%	0.39%	0.34%	0.24%	0.09%	0.24%
0.32%	0.39%	0.34%	0.33%	0.09%	0.34%
0.29%	0.39%	0.34%	0.29%	0.09%	0.29%
0.26%	0.39%	0.33%	0.25%	0.09%	0.25%
0.24%	0.38%	0.32%	0.23%	0.10%	0.24%
0.22%	0.36%	0.32%	0.22%	0.09%	0.22%
0.21%	0.35%	0.31%	0.20%	0.09%	0.20%
0.20%	0.34%	0.30%	0.18%	0.08%	0.18%
0.19%	0.34%	0.30%	0.22%	0.08%	0.22%
0.20%	0.34%	0.31%	0.21%	0.09%	0.21%
0.19%	0.33%	0.30%	0.18%	0.09%	0.18%
0.18%	0.33%	0.30%	0.16%	0.11%	0.16%
0.17%	0.34%	0.30%	0.15%	0.10%	0.15%
0.17%	0.34%	0.31%	0.15%	0.09%	0.14%
0.17%	0.33%	0.31%	0.13%	0.12%	0.13%
0.18%	0.35%	0.30%	0.12%	0.11%	0.12%
0.18%	0.34%	0.32%	0.14%	0.11%	0.14%
0.17%	0.34%	0.31%	0.13%	0.11%	0.12%
0.16%	0.33%	0.31%	0.13%	0.13%	0.13%
0.16%	0.33%	0.30%	0.12%	0.15%	0.12%
0.16%	0.34%	0.30%	0.11%	0.23%	0.11%
0.16%	0.34%	0.29%	0.11%	0.21%	0.11%
0.19%	0.34%	0.33%	0.13%	0.20%	0.13%
0.21%	0.35%	0.35%	0.13%	0.21%	0.13%
0.23%	0.35%	0.34%	0.13%	0.19%	0.13%
0.23%	0.34%	0.33%	0.14%	0.18%	0.14%
0.25%	0.34%	0.33%	0.13%	0.17%	0.13%
0.27%	0.35%	0.33%	0.13%	0.15%	0.12%
0.28%	0.35%	0.33%	0.14%	0.14%	0.13%
0.25%	0.35%	0.32%	0.14%	0.14%	0.14%
0.29%	0.34%	0.31%	0.13%	0.13%	0.13%
0.32%	0.36%	0.31%	0.12%	0.14%	0.12%
0.29%	0.35%	0.30%	0.11%	0.13%	0.11%
0.26%	0.34%	0.30%	0.11%	0.13%	0.11%
0.27%	0.33%	0.33%	0.11%	0.18%	0.10%
0.24%	0.33%	0.33%	0.11%	0.18%	0.11%
0.25%	0.32%	0.32%	0.11%	0.17%	0.11%
0.45%	0.44%	0.35%	0.11%	0.21%	0.10%
0.40%	0.44%	0.37%	0.11%	0.19%	0.10%
0.36%	0.43%	0.44%	0.10%	0.18%	0.10%
0.36%	0.42%	0.41%	0.11%	0.17%	0.11%
0.36%	0.41%	0.39%	0.14%	0.20%	0.13%
0.32%	0.42%	0.37%	0.13%	0.18%	0.13%
0.29%	0.42%	0.36%	0.12%	0.17%	0.12%
0.28%	0.41%	0.40%	0.11%	0.15%	0.11%
0.26%	0.39%	0.40%	0.11%	0.18%	0.11%
0.23%	0.38%	0.38%	0.11%	0.18%	0.10%

0.21%	0.38%	0.37%	0.15%	0.19%	0.15%
0.22%	0.38%	0.35%	0.15%	0.18%	0.15%
0.26%	0.37%	0.38%	0.21%	0.16%	0.21%
0.24%	0.37%	0.36%	0.19%	0.15%	0.19%
0.23%	0.36%	0.36%	0.17%	0.14%	0.17%
0.29%	0.38%	0.36%	0.20%	0.15%	0.20%
0.27%	0.41%	0.35%	0.18%	0.14%	0.18%
0.34%	0.40%	0.37%	0.20%	0.19%	0.20%
0.64%	0.40%	0.36%	0.18%	0.18%	0.18%
0.54%	0.39%	0.38%	0.16%	0.16%	0.16%
0.74%	0.44%	0.50%	0.14%	0.20%	0.14%
0.67%	0.44%	0.47%	0.14%	0.18%	0.14%
1.01%	0.42%	0.48%	0.13%	0.21%	0.13%
0.85%	0.41%	0.46%	0.12%	0.18%	0.12%
0.71%	0.48%	0.44%	0.12%	0.17%	0.12%
0.75%	0.47%	0.49%	0.12%	0.19%	0.12%
0.64%	0.46%	0.47%	0.11%	0.19%	0.11%
0.74%	0.49%	0.46%	0.11%	0.17%	0.11%
0.63%	0.47%	0.43%	0.12%	0.18%	0.11%
0.55%	0.45%	0.41%	0.11%	0.17%	0.10%
0.47%	0.43%	0.40%	0.10%	0.15%	0.10%
0.47%	0.42%	0.45%	0.10%	0.15%	0.09%
0.54%	0.40%	0.43%	0.09%	0.15%	0.09%
0.46%	0.41%	0.41%	0.09%	0.14%	0.09%
0.42%	0.40%	0.40%	0.09%	0.13%	0.08%
0.37%	0.39%	0.38%	0.09%	0.13%	0.08%
0.43%	0.38%	0.37%	0.09%	0.13%	0.08%
0.40%	0.44%	0.36%	0.09%	0.13%	0.09%
0.58%	0.44%	0.38%	0.09%	0.16%	0.08%
0.55%	0.45%	0.39%	0.12%	0.16%	0.12%
0.51%	0.48%	0.43%	0.13%	0.17%	0.13%
0.45%	0.46%	0.43%	0.13%	0.16%	0.13%
0.55%	0.51%	0.41%	0.12%	0.15%	0.12%
0.51%	0.49%	0.39%	0.12%	0.14%	0.11%
0.48%	0.48%	0.38%	0.11%	0.13%	0.11%
0.43%	0.46%	0.37%	0.11%	0.12%	0.11%
0.38%	0.49%	0.36%	0.11%	0.11%	0.11%
0.36%	0.47%	0.35%	0.11%	0.10%	0.10%
0.38%	0.45%	0.34%	0.17%	0.10%	0.16%
0.57%	0.46%	0.34%	0.15%	0.10%	0.15%
0.49%	0.44%	0.33%	0.26%	0.11%	0.26%
0.44%	0.44%	0.32%	0.29%	0.13%	0.29%
0.39%	0.43%	0.36%	0.25%	0.13%	0.25%
0.38%	0.41%	0.36%	0.22%	0.12%	0.22%
0.34%	0.40%	0.35%	0.21%	0.11%	0.21%
0.30%	0.38%	0.34%	0.25%	0.11%	0.25%
0.27%	0.37%	0.33%	0.26%	0.11%	0.26%

0.27%	0.38%	0.32%	0.23%	0.10%	0.23%
0.26%	0.37%	0.32%	0.21%	0.11%	0.21%
0.27%	0.36%	0.42%	0.19%	0.12%	0.19%
0.25%	0.36%	0.40%	0.17%	0.11%	0.17%
0.28%	0.35%	0.38%	0.16%	0.11%	0.16%
0.25%	0.34%	0.37%	0.15%	0.11%	0.15%
0.23%	0.34%	0.35%	0.14%	0.14%	0.14%
0.31%	0.43%	0.39%	0.22%	0.25%	0.22%
0.27%	0.43%	0.37%	0.42%	0.34%	0.42%
0.25%	0.42%	0.38%	0.52%	0.31%	0.53%
0.39%	0.41%	0.40%	0.45%	0.29%	0.46%
0.34%	0.40%	0.40%	0.38%	0.29%	0.39%
0.34%	0.39%	0.39%	0.33%	0.31%	0.33%
0.30%	0.37%	0.37%	0.33%	0.29%	0.34%

0.30%	0.42%	0.45%	0.28%	0.30%	0.28%
0.30%	0.37%	0.37%	0.33%	0.29%	0.34%

2.131443	1.519753	2.114701	3.029283	1.51554	2.676725
			10.66%	5.53%	9.54%
			12.67%	5.38%	11.31%
			11.66%	5.46%	10.43%

// Conditional Variance

Input Date: (ROE model)
User: (CPU title)

	Market Return	S&P Return	Ibbot LT RF	Aaa Corp	Aa Corp	Avg Aaa and Aa Corp	A PU	RPMKT	RPAAAAA	RPSPA	Mkt Annlized Return	RF Annualized Yield	AAAAA Annualized Yield	MRP RP	AAAAA RP
Jan-26	0.0000%		0.3100%												
Feb-26	-3.8500%		0.2800%					-4.1300%							
Mar-26	-5.7500%		0.3200%					-6.0700%							
Apr-26	2.5300%		0.3000%					2.2300%							
May-26	1.7900%		0.2800%					1.5100%							
Jun-26	4.5700%		0.3300%					4.2400%							
Jul-26	4.7900%		0.3100%					4.4800%							
Aug-26	2.4800%		0.3100%					2.1700%							
Sep-26	2.5200%		0.3000%					2.2200%							
Oct-26	-2.8400%		0.3000%					-3.1400%							
Nov-26	3.4700%		0.3100%					3.1600%							
Dec-26	1.9600%		0.3000%					1.6600%			11.61%	3.60%		8.01%	
Jan-27	-1.9300%		0.3000%					-2.2300%			9.45%	3.60%		5.85%	
Feb-27	5.3700%		0.2700%					5.1000%			19.95%	3.24%		16.71%	
Mar-27	0.8700%		0.2900%					0.5800%			28.37%	3.48%		24.89%	
Apr-27	2.0100%		0.2700%					1.7400%			27.72%	3.24%		24.48%	
May-27	6.0700%		0.2800%					5.7900%			33.09%	3.36%		29.73%	
Jun-27	-0.6700%		0.2700%					-0.9400%			26.42%	3.24%		23.18%	
Jul-27	6.7000%		0.2700%					6.4300%			28.73%	3.24%		25.49%	
Aug-27	5.1500%		0.2900%					4.8600%			32.08%	3.48%		28.60%	
Sep-27	4.5000%		0.2700%					4.2300%			34.63%	3.24%		31.39%	
Oct-27	-5.0200%		0.2800%					-5.3000%			31.61%	3.36%		28.25%	
Nov-27	7.2100%		0.2700%					6.9400%			36.37%	3.24%		33.13%	
Dec-27	2.7900%		0.2700%					2.5200%			37.48%	3.24%		34.24%	
Jan-28	-0.4000%	3.7500%	0.2700%	0.3717%	0.3842%	0.3779%	0.4042%	-0.6700%	-0.7779%	3.3458%	39.62%	3.24%		36.38%	
Feb-28	-1.2500%	-0.8000%	0.2500%	0.3717%	0.3842%	0.3779%	0.4042%	-1.5000%	-1.6279%	-1.2042%	30.85%	3.00%		27.85%	
Mar-28	11.0100%	7.2300%	0.2700%	0.3717%	0.3825%	0.3771%	0.4017%	10.7400%	10.6329%	6.8283%	44.01%	3.24%		40.77%	
Apr-28	3.4500%	9.8600%	0.2600%	0.3717%	0.3833%	0.3775%	0.4017%	3.1900%	3.0725%	9.4583%	46.04%	3.12%		42.92%	
May-28	1.9700%	2.0800%	0.2700%	0.3742%	0.3867%	0.3804%	0.4058%	1.7000%	1.5896%	1.6742%	40.39%	3.24%		37.15%	
Jun-28	-3.8500%	-4.0100%	0.2700%	0.3808%	0.3958%	0.3883%	0.4158%	-4.1200%	-4.2383%	-4.4258%	35.90%	3.24%		32.66%	
Jul-28	1.4100%	-0.7600%	0.2700%	0.3842%	0.3992%	0.3917%	0.4200%	1.1400%	1.0183%	-1.1800%	29.16%	3.24%		25.92%	
Aug-28	8.0300%	6.8200%	0.2900%	0.3867%	0.4017%	0.3942%	0.4233%	7.7400%	7.6358%	6.3967%	32.70%	3.48%		29.22%	
Sep-28	2.5900%	2.8700%	0.2700%	0.3842%	0.3992%	0.3917%	0.4208%	2.3200%	2.1983%	2.4492%	30.27%	3.24%		27.03%	
Oct-28	1.6800%	-0.9200%	0.3000%	0.3842%	0.3983%	0.3913%	0.4158%	1.3800%	1.2888%	-1.3358%	39.46%	3.60%		35.86%	
Nov-28	12.9200%	21.4700%	0.2700%	0.3817%	0.3933%	0.3875%	0.4150%	12.6500%	12.5325%	21.0550%	46.89%	3.24%		43.65%	
Dec-28	0.4900%	1.0000%	0.2900%	0.3842%	0.3975%	0.3908%	0.4208%	0.2000%	0.0992%	0.5792%	43.61%	3.48%	4.69%	40.13%	38.92%
Jan-29	5.8300%	13.2500%	0.2900%	0.3850%	0.3992%	0.3921%	0.4208%	5.5400%	5.4379%	12.8292%	52.59%	3.48%	4.71%	49.11%	47.88%
Feb-29	-0.1900%	-2.3200%	0.2700%	0.3883%	0.4050%	0.3967%	0.4250%	-0.4600%	-0.5867%	-2.7450%	54.23%	3.24%	4.76%	50.99%	49.47%
Mar-29	-0.1200%	-1.1000%	0.2800%	0.3917%	0.4100%	0.4008%	0.4283%	-0.4000%	-0.5208%	-1.5283%	38.76%	3.36%	4.81%	35.40%	33.95%
Apr-29	1.7600%	3.4700%	0.3400%	0.3908%	0.4092%	0.4000%	0.4283%	1.4200%	1.3600%	3.0417%	36.50%	4.08%	4.80%	32.42%	31.70%
May-29	-3.6200%	4.7000%	0.3000%	0.3917%	0.4092%	0.4004%	0.4283%	-3.9200%	-4.0204%	4.2717%	29.01%	3.60%	4.81%	25.41%	24.21%
Jun-29	11.4000%	21.7800%	0.2900%	0.3975%	0.4150%	0.4063%	0.4358%	11.1100%	10.9938%	21.3442%	49.48%	3.48%	4.88%	46.00%	44.60%
Jul-29	4.7100%	9.0500%	0.3200%	0.3975%	0.4142%	0.4058%	0.4367%	4.3900%	4.3042%	8.6133%	54.34%	3.84%	4.87%	50.50%	49.47%
Aug-29	10.2800%	10.3300%	0.3000%	0.3992%	0.4158%	0.4075%	0.4417%	9.9800%	9.8725%	9.8883%	57.55%	3.60%	4.89%	53.95%	52.66%
Sep-29	-4.7600%	0.0400%	0.3200%	0.4000%	0.4175%	0.4088%	0.4483%	-5.0800%	-5.1688%	-0.4083%	46.27%	3.84%	4.91%	42.43%	41.36%
Oct-29	-19.7300%	-30.2200%	0.3100%	0.3975%	0.4175%	0.4075%	0.4450%	-20.0400%	-20.1375%	-30.6650%	15.47%	3.72%	4.89%	11.75%	10.58%
Nov-29	-12.4600%	-14.2400%	0.2600%	0.3967%	0.4117%	0.4042%	0.4408%	-12.7200%	-12.8642%	-14.6808%	-10.48%	3.12%	4.85%	-13.60%	-15.33%
Dec-29	2.8200%	6.8000%	0.3100%	0.3892%	0.4033%	0.3963%	0.4358%	2.5100%	2.4238%	6.3642%	-8.41%	3.72%	4.76%	-12.13%	-13.16%
Jan-30	6.3900%	7.4000%	0.2900%	0.3883%	0.4050%	0.3967%	0.4383%	6.1000%	5.9933%	6.9617%	-7.92%	3.48%	4.76%	-11.40%	-12.68%
Feb-30	2.5900%	8.8500%	0.2600%	0.3908%	0.4075%	0.3992%	0.4408%	2.3300%	2.1908%	8.4092%	-5.36%	3.12%	4.79%	-8.48%	-10.15%
Mar-30	8.1200%	8.9100%	0.2900%	0.3850%	0.4000%	0.3925%	0.4317%	7.8300%	7.7275%	8.4783%	2.45%	3.48%	4.71%	-1.03%	-2.26%
Apr-30	-0.8000%	3.4100%	0.2700%	0.3833%	0.3983%	0.3908%	0.4292%	-1.0700%	-1.1908%	2.9808%	-0.13%	3.24%	4.69%	-3.37%	-4.82%
May-30	-0.9600%	-2.3600%	0.2700%	0.3833%	0.3975%	0.3904%	0.4200%	-1.2300%	-1.3504%	-2.7800%	2.63%	3.24%	4.69%	-0.61%	-2.06%
Jun-30	-16.2500%	-19.0300%	0.2900%	0.3808%	0.3967%	0.3888%	0.4175%	-16.5400%	-16.6388%	-19.4475%	-22.85%	3.48%	4.67%	-26.33%	-27.51%
Jul-30	3.8600%	1.7600%	0.2800%	0.3767%	0.3950%	0.3858%	0.4158%	3.5800%	3.4742%	1.3442%	-23.47%	3.36%	4.63%	-26.83%	-28.10%
Aug-30	1.4100%	0.7600%	0.2600%	0.3725%	0.3900%	0.3813%	0.4125%	1.1500%	1.0288%	0.3475%	-29.63%	3.12%	4.58%	-32.75%	-34.20%
Sep-30	-12.8200%	-11.0800%	0.2900%	0.3683%	0.3875%	0.3779%	0.4050%	-13.1100%	-13.1979%	-11.4850%	-35.58%	3.48%	4.54%	-39.06%	-40.12%
Oct-30	-8.5500%	-8.1800%	0.2700%	0.3683%	0.3892%	0.3788%	0.4067%	-8.8200%	-8.9288%	-8.5867%	-26.61%	3.24%	4.55%	-29.85%	-31.16%
Nov-30	-0.8900%	-7.3000%	0.2600%	0.3725%	0.3958%	0.3842%	0.4133%	-1.1500%	-1.2742%	-7.7133%	-16.91%	3.12%	4.61%	-20.03%	-21.52%
Dec-30	-7.0600%	-3.3900%	0.2800%	0.3767%	0.4042%	0.3904%	0.4258%	-7.3400%	-7.4504%	-3.8158%	-24.90%	3.36%	4.69%	-28.26%	-29.58%
Jan-31	5.0200%	5.4000%	0.2800%	0.3683%	0.3917%	0.3800%	0.4175%	4.7400%	4.6400%	4.9825%	-25.86%	3.36%	4.56%	-29.22%	-30.42%
Feb-31	11.9300%	15.2400%	0.2600%	0.3692%	0.3917%	0.3804%	0.4175%	11.6700%	11.5496%	14.8225%	-19.11%	3.12%	4.57%	-22.23%	-23.68%
Mar-31	-6.7500%	-2.3900%	0.2900%	0.3658%	0.3892%	0.3775%	0.4150%	-7.0400%	-7.1275%	-2.8050%	-30.24%	3.48%	4.53%	-33.72%	-34.77%
Apr-31	-9.3500%	-10.5400%	0.2700%	0.3667%	0.3967%	0.3817%	0.4050%	-9.6200%	-9.7317%	-10.9450%	-36.25%	3.24%	4.58%	-39.49%	-40.83%
May-31	-12.7900%	-10.2900%	0.2600%	0.3642%	0.3967%	0.3804%	0.4033%	-13.0500%	-13.1704%	-10.6933%	-43.86%	3.12%	4.57%	-46.98%	-48.43%
Jun-31	14.2100%	13.7300%	0.2800%	0.3633%	0.4008%	0.3821%	0.4058%	13.9300%	13.8279%	13.3242%	-23.45%	3.36%	4.59%	-26.81%	-28.03%
Jul-31	-7.2200%	-6.2200%	0.2700%	0.3633%	0.4008%	0.3821%	0.4025%	-7.4900%	-7.6021%	-6.6225%	-31.61%	3.24%	4.59%	-34.85%	-36.20%
Aug-31	1.8200%	2.5600%	0.2700%	0.3667%	0.4042%	0.3854%	0.4008%	1.5500%	1.4346%	2.1592%	-31.34%	3.24%	4.63%	-34.58%	-35.96%
Sep-31	-29.7300%	-31.4900%	0.2700%	0.3792%	0.4233%	0.4013%	0.4208%	-30.0000%	-30.1313%	-31.9108%	-44.66%	3.24%	4.82%	-47.90%	-49.47%
Oct-31	8.9600%	9.9000%	0.2900%	0.4158%	0.4642%	0.4400%	0.4617%	8.6700%	8.5200%	9.4383%	-34.06%	3.48%	5.28%	-37.54%	-39.34%
Nov-31	-7.9800%	-6.1400%	0.3100%	0.4117%	0.4675%	0.4396%	0.4592%	-8.2900%	-8.4196%	-6.5992%	-38.78%	3.72%	5.28%	-42.50%	-44.05%
Dec-31	-14.0000%	-12.8300%	0.3200%	0.4433%	0.5217%	0.4825%	0.5200%	-14.3200%	-14.4825%	-13.3500%	-43.35%	3.84%	5.79%	-47.19%	-49.14%
Jan-32	-2.7100%	-2.0000%	0.3200%	0.4333%	0.5067%	0.4700%	0.5142%	-3.0300%	-3.1800%	-2.5142%	-47.52%	3.84%	5.64%	-51.36%	-53.16%
Feb-32	5.7000%	7.9900%	0.3200%	0.4358%	0.5108%	0.4733%	0.5342%	5.3800%	5.2267%	7.4558%	-50.44%	3.84%	5.68%	-54.28%	-56.12%
Mar-32	-11.5800%	-10.5800%	0.3100%	0.4150%	0.4875%	0.4513%	0.5050%	-11.8900%	-12.0313%	-11.0850%	-53.01%	3.72%	5.42%	-56.73%	-58.42%
Apr-32	-19.9700%	-15.3500%	0.3000%	0.4308%	0.5092%	0.4700%	0.5692%	-20.2700%	-20.4400%	-15.9192%	-58.51%	3.60%	5.64%	-62.11%	-64.15%
May-32	-21.9600%	-28.0600%	0.2800%	0.4467%	0.5317%	0.4892%	0.6133%	-22.2400%	-22.4492%	-28.6733%	-62.87%	3.36%	5.87%	-66.23%	-68.74%
Jun-32	-0.2200%	0.9000%	0.2800%	0.4508%	0.5500%	0.5004%	0.6308%	-0.5000%	-0.7204%	0.2692%	-67.57%	3.36%	6.01%	-70.93%	-73.57%

	Market Return	S&P Return	Ibbot LT RF	Aaa Corp	Aa Corp	Avg Aaa and Aa Corp	A PU	RPMKT	RPAAAAA	RPSPA	Mkt Annlized Return	RF Annualized Yield	AAAAA Annualized Yield	MRP RP	AAAAA RP
Jul-32	38.1500%	33.1800%	0.2800%	0.4383%	0.5425%	0.4904%	0.6067%	37.8700%	37.6596%	32.5733%	-51.70%	3.36%	5.89%	-55.06%	-57.59%
Aug-32	38.6900%	40.3000%	0.2800%	0.4092%	0.4858%	0.4475%	0.5292%	38.4100%	38.2425%	39.7708%	-34.22%	3.36%	5.37%	-37.58%	-39.59%
Sep-32	-3.4600%	-2.7000%	0.2600%	0.3917%	0.4617%	0.4267%	0.4925%	-3.7200%	-3.8867%	-3.1925%	-9.62%	3.12%	5.12%	-12.74%	-14.74%
Oct-32	-13.4900%	-10.4700%	0.2700%	0.3867%	0.4592%	0.4229%	0.4842%	-13.7600%	-13.9129%	-10.9542%	-28.24%	3.24%	5.08%	-31.48%	-33.32%
Nov-32	-4.1700%	-3.5400%	0.2600%	0.3858%	0.4642%	0.4250%	0.4900%	-4.4300%	-4.5950%	-4.0300%	-25.27%	3.12%	5.10%	-28.39%	-30.37%
Dec-32	5.6500%	8.9300%	0.2700%	0.3825%	0.4667%	0.4246%	0.4875%	5.3800%	5.2254%	8.4425%	-8.20%	3.24%	5.10%	-11.44%	-13.29%
Jan-33	0.8700%	-3.1100%	0.2700%	0.3700%	0.4417%	0.4058%	0.4492%	0.6000%	0.4642%	-3.5592%	-4.82%	3.24%	4.87%	-8.06%	-9.69%
Feb-33	-17.7200%	-19.8400%	0.2300%	0.3733%	0.4458%	0.4096%	0.4808%	-17.9500%	-18.1296%	-20.3208%	-25.91%	2.76%	4.92%	-28.67%	-30.82%
Mar-33	3.5300%	-10.8000%	0.2700%	0.3900%	0.4675%	0.4288%	0.5283%	3.2600%	3.1013%	-11.3283%	-13.25%	3.24%	5.15%	-16.49%	-18.39%
Apr-33	42.5600%	26.3500%	0.2500%	0.3983%	0.4842%	0.4413%	0.5742%	42.3100%	42.1188%	25.7758%	54.53%	3.00%	5.30%	51.53%	49.24%
May-33	16.8300%	17.3200%	0.2800%	0.3858%	0.4500%	0.4179%	0.5417%	16.5500%	16.4121%	16.7783%	131.34%	3.36%	5.02%	127.98%	126.33%
Jun-33	13.3800%	14.2600%	0.2500%	0.3717%	0.4242%	0.3979%	0.5092%	13.1300%	12.9821%	13.7508%	162.88%	3.00%	4.78%	159.88%	158.10%
Jul-33	-8.6200%	-12.0400%	0.2600%	0.3633%	0.4025%	0.3829%	0.4925%	-8.8800%	-9.0029%	-12.5325%	73.88%	3.12%	4.60%	70.76%	69.29%
Aug-33	12.0600%	-0.5600%	0.2600%	0.3583%	0.3975%	0.3779%	0.4983%	11.8000%	11.6821%	-1.0583%	40.49%	3.12%	4.54%	37.37%	35.96%
Sep-33	-11.1800%	-17.5900%	0.2500%	0.3633%	0.4133%	0.3883%	0.5300%	-11.4300%	-11.5683%	-18.1200%	29.26%	3.00%	4.66%	26.26%	24.60%
Oct-33	-8.5500%	-7.1200%	0.2600%	0.3617%	0.4142%	0.3879%	0.5300%	-8.8100%	-8.9379%	-7.6500%	36.64%	3.12%	4.66%	33.52%	31.99%
Nov-33	11.2700%	-1.8000%	0.2500%	0.3783%	0.4458%	0.4121%	0.5883%	11.0200%	10.8579%	-2.3883%	58.66%	3.00%	4.95%	55.66%	53.71%
Dec-33	2.5300%	1.2600%	0.2800%	0.3750%	0.4392%	0.4071%	0.6017%	2.2500%	2.1229%	0.6583%	53.97%	3.36%	4.89%	50.61%	49.09%
Jan-34	10.6900%	17.4600%	0.2900%	0.3625%	0.4167%	0.3896%	0.5467%	10.4000%	10.3004%	16.9133%	68.96%	3.48%	4.68%	65.48%	64.28%
Feb-34	-3.2200%	-2.4200%	0.2400%	0.3500%	0.3917%	0.3708%	0.4817%	-3.4600%	-3.5908%	-2.9017%	98.73%	2.88%	4.45%	95.85%	94.28%
Mar-34	0.0000%	-1.1100%	0.2700%	0.3442%	0.3792%	0.3617%	0.4717%	-0.2700%	-0.3617%	-1.5817%	91.96%	3.24%	4.34%	88.72%	87.62%
Apr-34	-2.5100%	-3.5100%	0.2500%	0.3392%	0.3692%	0.3542%	0.4533%	-2.7600%	-2.8642%	-3.9633%	31.27%	3.00%	4.25%	28.27%	27.02%
May-34	-7.3600%	-7.6500%	0.2500%	0.3342%	0.3642%	0.3492%	0.4492%	-7.6100%	-7.7092%	-8.0992%	4.09%	3.00%	4.19%	1.09%	-0.10%
Jun-34	2.2900%	4.7800%	0.2400%	0.3275%	0.3583%	0.3429%	0.4500%	2.0500%	1.9471%	4.3300%	-6.09%	2.88%	4.12%	-8.97%	-10.21%
Jul-34	-11.3200%	-16.0300%	0.2400%	0.3242%	0.3567%	0.3404%	0.4408%	-11.5600%	-11.6604%	-16.4708%	-8.86%	2.88%	4.09%	-11.74%	-12.95%
Aug-34	6.1100%	2.6900%	0.2400%	0.3275%	0.3617%	0.3446%	0.4525%	5.8700%	5.7654%	2.2375%	-13.70%	2.88%	4.14%	-16.58%	-17.84%
Sep-34	-0.3300%	0.9500%	0.2300%	0.3300%	0.3683%	0.3492%	0.4633%	-0.5600%	-0.6792%	0.4867%	-3.16%	2.76%	4.19%	-5.92%	-7.35%
Oct-34	-2.8600%	-6.6600%	0.2700%	0.3250%	0.3633%	0.3442%	0.4500%	-3.1300%	-3.2042%	-7.1100%	2.86%	3.24%	4.13%	-0.38%	-1.27%
Nov-34	9.4200%	-0.4800%	0.2500%	0.3217%	0.3567%	0.3392%	0.4483%	9.1700%	9.0808%	-0.9283%	1.15%	3.00%	4.07%	-1.85%	-2.92%
Dec-34	-0.1000%	-7.0100%	0.2500%	0.3175%	0.3558%	0.3367%	0.4467%	-0.3500%	-0.4367%	-7.4567%	-1.44%	3.00%	4.04%	-4.44%	-5.48%
Jan-35	-4.1100%	-2.3100%	0.2500%	0.3142%	0.3508%	0.3325%	0.4317%	-4.3600%	-4.4425%	-2.7417%	-14.62%	3.00%	3.99%	-17.62%	-18.61%
Feb-35	-3.4100%	-11.3600%	0.2100%	0.3075%	0.3442%	0.3258%	0.4133%	-3.6200%	-3.7358%	-11.7733%	-14.79%	2.52%	3.91%	-17.31%	-18.70%
Mar-35	-2.8600%	10.4300%	0.2200%	0.3058%	0.3425%	0.3242%	0.4067%	-3.0800%	-3.1842%	10.0233%	-17.22%	2.64%	3.89%	-19.86%	-21.11%
Apr-35	9.8000%	11.7800%	0.2300%	0.3050%	0.3400%	0.3225%	0.3992%	9.5700%	9.4775%	11.3808%	-6.77%	2.76%	3.87%	-9.53%	-10.64%
May-35	4.0900%	11.0600%	0.2300%	0.3042%	0.3358%	0.3200%	0.3842%	3.8600%	3.7700%	10.6758%	4.75%	2.76%	3.84%	1.99%	0.91%
Jun-35	6.9900%	10.3600%	0.2200%	0.3008%	0.3325%	0.3167%	0.3775%	6.7700%	6.6733%	9.9825%	9.56%	2.64%	3.80%	6.92%	5.76%
Jul-35	8.5000%	8.7000%	0.2400%	0.2967%	0.3242%	0.3104%	0.3683%	8.2600%	8.1896%	8.3317%	34.05%	2.88%	3.73%	31.17%	30.33%
Aug-35	2.8000%	5.6300%	0.2300%	0.3000%	0.3225%	0.3113%	0.3700%	2.5700%	2.4888%	5.2600%	29.87%	2.76%	3.74%	27.11%	26.13%
Sep-35	2.5600%	-1.2200%	0.2300%	0.2992%	0.3208%	0.3100%	0.3692%	2.3300%	2.2500%	-1.5892%	33.63%	2.76%	3.72%	30.87%	29.91%
Oct-35	7.7700%	12.2400%	0.2300%	0.2933%	0.3183%	0.3058%	0.3667%	7.5400%	7.4642%	11.8733%	48.26%	2.76%	3.67%	45.50%	44.59%
Nov-35	4.7400%	1.0800%	0.2400%	0.2892%	0.3108%	0.3000%	0.3625%	4.5000%	4.4400%	0.7175%	41.92%	2.88%	3.60%	39.04%	38.32%
Dec-35	3.9400%	4.7900%	0.2400%	0.2867%	0.3042%	0.2954%	0.3575%	3.7000%	3.6446%	4.4325%	47.66%	2.88%	3.55%	44.78%	44.11%
Jan-36	6.7000%	11.0300%	0.2400%	0.2808%	0.2975%	0.2892%	0.3508%	6.4600%	6.4108%	10.6792%	64.30%	2.88%	3.47%	61.42%	60.83%
Feb-36	2.2400%	-3.4200%	0.2300%	0.2767%	0.2958%	0.2863%	0.3475%	2.0100%	1.9538%	-3.7675%	73.91%	2.76%	3.44%	71.15%	70.48%
Mar-36	2.6800%	0.3300%	0.2400%	0.2742%	0.2958%	0.2850%	0.3475%	2.4400%	2.3950%	-0.0175%	83.83%	2.88%	3.42%	80.95%	80.41%
Apr-36	-7.5100%	-8.1400%	0.2200%	0.2742%	0.2975%	0.2858%	0.3475%	-7.7300%	-7.7958%	-8.4875%	54.85%	2.64%	3.43%	52.21%	51.42%
May-36	5.4500%	7.6100%	0.2200%	0.2725%	0.2942%	0.2833%	0.3450%	5.2300%	5.1667%	7.2650%	56.87%	2.64%	3.40%	54.23%	53.47%
Jun-36	3.3300%	3.5000%	0.2400%	0.2700%	0.2925%	0.2813%	0.3433%	3.0900%	3.0488%	3.1567%	51.51%	2.88%	3.38%	48.63%	48.13%
Jul-36	7.0100%	10.0900%	0.2300%	0.2692%	0.2900%	0.2796%	0.3392%	6.7800%	6.7304%	9.7508%	49.43%	2.76%	3.36%	46.67%	46.07%
Aug-36	1.5100%	-0.1800%	0.2300%	0.2675%	0.2867%	0.2771%	0.3383%	1.2800%	1.2329%	-0.5183%	47.55%	2.76%	3.33%	44.79%	44.23%
Sep-36	0.3100%	-2.2500%	0.2100%	0.2650%	0.2842%	0.2746%	0.3375%	0.1000%	0.0354%	-2.5875%	44.31%	2.52%	3.30%	41.79%	41.02%
Oct-36	7.7500%	5.6600%	0.2300%	0.2650%	0.2808%	0.2729%	0.3367%	7.5200%	7.4771%	5.3233%	44.29%	2.76%	3.28%	41.53%	41.01%
Nov-36	1.3400%	-1.6900%	0.2200%	0.2625%	0.2758%	0.2692%	0.3292%	1.1200%	1.0708%	-2.0192%	39.60%	2.64%	3.23%	36.96%	36.37%
Dec-36	-0.2900%	-1.7400%	0.2200%	0.2583%	0.2733%	0.2658%	0.3192%	-0.5100%	-0.5558%	-2.0592%	33.92%	2.64%	3.19%	31.28%	30.73%
Jan-37	3.9000%	1.9500%	0.2100%	0.2583%	0.2750%	0.2667%	0.3183%	3.6900%	3.6333%	1.6317%	30.41%	2.52%	3.20%	27.89%	27.21%
Feb-37	1.9100%	-3.5300%	0.2000%	0.2683%	0.2833%	0.2758%	0.3242%	1.7100%	1.6342%	-3.8542%	29.99%	2.40%	3.31%	27.59%	26.68%
Mar-37	-0.7700%	-5.7300%	0.2200%	0.2767%	0.2917%	0.2842%	0.3333%	-0.9900%	-1.0542%	-6.0633%	25.62%	2.64%	3.41%	22.98%	22.21%
Apr-37	-8.0900%	-7.3600%	0.2300%	0.2850%	0.2975%	0.2913%	0.3392%	-8.3200%	-8.3813%	-7.6992%	24.83%	2.76%	3.50%	22.07%	21.34%
May-37	-0.2400%	-5.1600%	0.2200%	0.2775%	0.2900%	0.2838%	0.3333%	-0.4600%	-0.5238%	-5.4933%	18.10%	2.64%	3.41%	15.46%	14.69%
Jun-37	-5.0400%	-4.6700%	0.2500%	0.2733%	0.2858%	0.2796%	0.3325%	-5.2900%	-5.3196%	-5.0025%	8.53%	3.00%	3.36%	5.53%	5.17%
Jul-37	10.4500%	16.7100%	0.2400%	0.2708%	0.2842%	0.2775%	0.3283%	10.2100%	10.1725%	16.3817%	12.02%	2.88%	3.33%	9.14%	8.69%
Aug-37	-4.8300%	-9.0300%	0.2300%	0.2700%	0.2842%	0.2771%	0.3242%	-5.0600%	-5.1071%	-9.3542%	5.02%	2.76%	3.33%	2.26%	1.70%
Sep-37	-14.0300%	-11.7400%	0.2300%	0.2733%	0.2883%	0.2808%	0.3300%	-14.2600%	-14.3108%	-12.0700%	-9.99%	2.76%	3.37%	-12.75%	-13.36%
Oct-37	-9.8100%	-5.1600%	0.2300%	0.2725%	0.2942%	0.2833%	0.3408%	-10.0400%	-10.0933%	-5.5008%	-24.66%	2.76%	3.40%	-27.42%	-28.06%
Nov-37	-8.6600%	0.8000%	0.2400%	0.2700%	0.2950%	0.2825%	0.3400%	-8.9000%	-8.9425%	0.4600%	-32.09%	2.88%	3.39%	-34.97%	-35.48%
Dec-37	-4.5900%	-9.5100%	0.2300%	0.2675%	0.2917%	0.2796%	0.3358%	-4.8200%	-4.8696%	-9.8458%	-35.02%	2.76%	3.36%	-37.78%	-38.38%
Jan-38	1.5200%	-3.6800%	0.2300%	0.2642%	0.2917%	0.2779%	0.3342%	1.2900%	1.2421%	-4.0142%	-36.51%	2.76%	3.34%	-39.27%	-39.85%
Feb-38	6.7400%	3.4100%	0.2100%	0.2667%	0.2925%	0.2796%	0.3358%	6.5300%	6.4604%	3.0742%	-33.50%	2.52%	3.36%	-36.02%	-36.86%
Mar-38	-24.8700%	-19.8400%	0.2300%	0.2683%	0.2967%	0.2825%	0.3325%	-25.1000%	-25.1525%	-20.1725%	-49.65%	2.76%	3.39%	-52.41%	-53.04%
Apr-38	14.4700%	15.3800%	0.2200%	0.2750%	0.3108%	0.2929%	0.3400%	14.2500%	14.1771%	15.0400%	-37.29%	2.64%	3.52%	-39.93%	-40.81%
May-38	-3.3000%	1.8100%	0.2200%	0.2683%	0.2967%	0.2825%	0.3292%	-3.5200%	-3.5825%	1.4808%	-39.22%	2.64%	3.39%	-41.86%	-42.61%
Jun-38	25.0300%	16.2200%	0.2100%	0.2717%	0.3067%	0.2892%	0.3292%	24.8200%	24.7408%	15.8908%	-19.97%	2.52%	3.47%	-22.49%	-23.44%
Jul-38	7.4400%	1.4800%	0.2100%	0.2683%	0.3017%	0.2850%	0.3217%	7.2300%	7.1550%	1.1583%	-22.15%	2.52%	3.42%	-24.67%	-25.57%
Aug-38	-2.2600%	-5.5700%	0.2200%	0.2650%	0.2975%	0.2813%	0.3200%	-2.4800%	-2.5413%	-5.8900%	-20.05%	2.64%	3.38%	-22.69%	-23.42%
Sep-38	1.6600%	1.9100%	0.2100%	0.2675%	0.3000%	0.2838%	0.3233%	1.4500%	1.3763%	1.5867%	-5.46%	2.52%	3.41%	-7.98%	-8.86%
Oct-38	7.7600%	18.0100%	0.2200%	0.2625%	0.2942%	0.2783%	0.3158%	7.5400%	7.4817%	17.6942%	12.96%	2.64%	3.34%	10.32%	9.62%
Nov-38	-2.7300%	-6.2000%	0.2100%	0.2583%	0.2883%	0.2733%	0.3108%	-2.9400%	-3.0033%	-6.5108%	20.29%	2.52%	3.28%	17.77%	17.01%
Dec-38	4.0100%	3.9100%	0.2200%	0.2567%	0.2850%	0.2708%	0.3117%	3.7900%	3.7392%	3.5983%	31.14%	2.64%	3.25%	28.50%	27.89%
Jan-39	-6.7400%	1.6500%	0.2100%	0.2508%	0.2767%	0.2638%	0.3067%	-6.9500%	-7.0038%	1.3433%	20.47%	2.52%	3.17%	17.95%	17.30%
Feb-39	3.9000%	8.0100%	0.1900%	0.2500%	0.2717%	0.2608%	0.2992%	3.7100%	3.6392%	7.7108%	17.26%	2.28%	3.13%	14.98%	14.13%
Mar-39	-13.3900%	-13.7800%	0.2100%	0.2492%	0.2683%	0.2588%	0.2950%	-13.6000%	-13.6488%	-14.0750%	35.18%	2.52%	3.11%	32.66%	32.07%

	Market Return	S&P Return	Ibbot LT RF	Aaa Corp	Aa Corp	Avg Aaa and Aa Corp	A PU	RPMKT	RPAAAAA	RPSPA	Mkt Annlized Return	RF Annualized Yield	AAAAA Annualized Yield	MRP RP	AAAAA RP
Apr-39	-0.2700%	2.8500%	0.1900%	0.2517%	0.2683%	0.2600%	0.2958%	-0.4600%	-0.5300%	2.5542%	17.77%	2.28%	3.12%	15.49%	14.65%
May-39	7.3300%	6.6500%	0.2000%	0.2475%	0.2633%	0.2554%	0.2917%	7.1300%	7.0746%	6.3583%	30.72%	2.40%	3.07%	28.32%	27.65%
Jun-39	-6.1200%	-4.2300%	0.1800%	0.2433%	0.2608%	0.2521%	0.2892%	-6.3000%	-6.3721%	-4.5192%	-1.85%	2.16%	3.03%	-4.01%	-4.87%
Jul-39	11.0500%	12.0800%	0.1900%	0.2408%	0.2567%	0.2488%	0.2858%	10.8600%	10.8013%	11.7942%	1.45%	2.28%	2.99%	-0.83%	-1.54%
Aug-39	-6.4800%	-6.4700%	0.1800%	0.2442%	0.2592%	0.2517%	0.2842%	-6.6600%	-6.7317%	-6.7542%	-2.93%	2.16%	3.02%	-5.09%	-5.95%
Sep-39	16.7300%	4.2100%	0.1900%	0.2708%	0.2908%	0.2808%	0.3092%	16.5400%	16.4492%	3.9008%	11.46%	2.28%	3.37%	9.18%	8.09%
Oct-39	-1.2300%	1.3000%	0.2300%	0.2625%	0.2792%	0.2708%	0.2983%	-1.4600%	-1.5008%	1.0017%	2.16%	2.76%	3.25%	-0.60%	-1.09%
Nov-39	-3.9800%	-1.5700%	0.2000%	0.2500%	0.2633%	0.2567%	0.2842%	-4.1800%	-4.2367%	-1.8542%	0.85%	2.40%	3.08%	-1.55%	-2.23%
Dec-39	2.7000%	2.7200%	0.1900%	0.2450%	0.2617%	0.2533%	0.2817%	2.5100%	2.4467%	2.4383%	-0.42%	2.28%	3.04%	-2.70%	-3.46%
Jan-40	-3.3600%	0.6900%	0.2000%	0.2400%	0.2567%	0.2483%	0.2783%	-3.5600%	-3.6083%	0.4117%	3.19%	2.40%	2.98%	0.79%	0.21%
Feb-40	1.3300%	-1.0200%	0.1800%	0.2383%	0.2542%	0.2463%	0.2792%	1.1500%	1.0838%	-1.2992%	0.63%	2.16%	2.96%	-1.53%	-2.32%
Mar-40	1.2400%	0.9400%	0.1900%	0.2367%	0.2533%	0.2450%	0.2783%	1.0500%	0.9950%	0.6617%	17.63%	2.28%	2.94%	15.35%	14.69%
Apr-40	-0.2400%	-0.9200%	0.1800%	0.2350%	0.2492%	0.2421%	0.2708%	-0.4200%	-0.4821%	-1.1908%	17.67%	2.16%	2.91%	15.51%	14.76%
May-40	-22.8900%	-19.6400%	0.1900%	0.2442%	0.2567%	0.2504%	0.2750%	-23.0800%	-23.1404%	-19.9150%	-15.46%	2.28%	3.01%	-17.74%	-18.47%
Jun-40	8.0900%	15.0600%	0.1900%	0.2467%	0.2583%	0.2525%	0.2783%	7.9000%	7.8375%	14.7817%	-2.67%	2.28%	3.03%	-4.95%	-5.70%
Jul-40	3.4100%	0.6500%	0.2000%	0.2400%	0.2508%	0.2454%	0.2692%	3.2100%	3.1646%	0.3808%	-9.36%	2.40%	2.95%	-11.76%	-12.31%
Aug-40	3.5000%	-0.9400%	0.1900%	0.2375%	0.2525%	0.2450%	0.2675%	3.3100%	3.2550%	-1.2075%	0.31%	2.28%	2.94%	-1.97%	-2.63%
Sep-40	1.2300%	-2.1100%	0.1800%	0.2350%	0.2508%	0.2429%	0.2650%	1.0500%	0.9871%	-2.3750%	-13.01%	2.16%	2.92%	-15.17%	-15.93%
Oct-40	4.2200%	3.1700%	0.1800%	0.2325%	0.2508%	0.2417%	0.2625%	4.0400%	3.9783%	2.9075%	-8.21%	2.16%	2.90%	-10.37%	-11.11%
Nov-40	-3.1600%	-12.0700%	0.1800%	0.2292%	0.2467%	0.2379%	0.2592%	-3.3400%	-3.3979%	-12.3292%	-7.43%	2.16%	2.86%	-9.59%	-10.28%
Dec-40	0.0900%	1.5400%	0.1700%	0.2258%	0.2433%	0.2346%	0.2583%	-0.0800%	-0.1446%	1.2817%	-9.78%	2.04%	2.82%	-11.82%	-12.59%
Jan-41	-4.6300%	-0.8400%	0.1600%	0.2292%	0.2458%	0.2375%	0.2625%	-4.7900%	-4.8675%	-1.1025%	-10.96%	1.92%	2.85%	-12.88%	-13.81%
Feb-41	-0.6000%	-2.3300%	0.1600%	0.2317%	0.2500%	0.2408%	0.2667%	-0.7600%	-0.8408%	-2.5967%	-12.66%	1.92%	2.89%	-14.58%	-15.55%
Mar-41	0.7100%	-2.8000%	0.1800%	0.2333%	0.2508%	0.2421%	0.2633%	0.5300%	0.4679%	-3.0633%	-13.12%	2.16%	2.91%	-15.28%	-16.02%
Apr-41	-6.1200%	-8.4400%	0.1700%	0.2350%	0.2533%	0.2442%	0.2617%	-6.2900%	-6.3642%	-8.7017%	-18.24%	2.04%	2.93%	-20.28%	-21.17%
May-41	1.8300%	-3.3700%	0.1700%	0.2342%	0.2492%	0.2417%	0.2567%	1.6600%	1.5883%	-3.6267%	7.97%	2.04%	2.90%	5.93%	5.07%
Jun-41	5.7800%	2.5700%	0.1600%	0.2308%	0.2458%	0.2383%	0.2525%	5.6200%	5.5417%	2.3175%	5.67%	1.92%	2.86%	3.75%	2.81%
Jul-41	5.7900%	5.3800%	0.1600%	0.2283%	0.2417%	0.2350%	0.2500%	5.6300%	5.5550%	5.1300%	8.10%	1.92%	2.82%	6.18%	5.28%
Aug-41	0.1000%	-1.9200%	0.1600%	0.2283%	0.2417%	0.2350%	0.2483%	-0.0600%	-0.1350%	-2.1683%	4.55%	1.92%	2.82%	2.63%	1.73%
Sep-41	-0.6800%	-2.8200%	0.1600%	0.2292%	0.2425%	0.2358%	0.2500%	-0.8400%	-0.9158%	-3.0700%	2.57%	1.92%	2.83%	0.65%	-0.26%
Oct-41	-6.5700%	-8.4800%	0.1600%	0.2275%	0.2392%	0.2333%	0.2500%	-6.7300%	-6.8033%	-8.7300%	-8.05%	1.92%	2.80%	-9.97%	-10.85%
Nov-41	-2.8400%	-6.5200%	0.1400%	0.2267%	0.2383%	0.2325%	0.2483%	-2.9800%	-3.0725%	-6.7683%	-7.74%	1.68%	2.79%	-9.42%	-10.53%
Dec-41	-4.0700%	-6.7800%	0.1600%	0.2333%	0.2458%	0.2396%	0.2550%	-4.2300%	-4.3096%	-7.0350%	-11.58%	1.92%	2.88%	-13.50%	-14.45%
Jan-42	1.6100%	2.5200%	0.2100%	0.2358%	0.2467%	0.2413%	0.2575%	1.4000%	1.3688%	2.2625%	-5.79%	2.52%	2.90%	-8.31%	-8.69%
Feb-42	-1.5900%	-3.3900%	0.1900%	0.2375%	0.2483%	0.2429%	0.2575%	-1.7800%	-1.8329%	-3.6475%	-6.73%	2.28%	2.92%	-9.01%	-9.64%
Mar-42	-6.5200%	-10.4600%	0.2100%	0.2383%	0.2500%	0.2442%	0.2600%	-6.7300%	-6.7642%	-10.7200%	-13.43%	2.52%	2.93%	-15.95%	-16.36%
Apr-42	-4.0000%	-4.3200%	0.2000%	0.2358%	0.2483%	0.2421%	0.2575%	-4.2000%	-4.2421%	-4.5775%	-11.47%	2.40%	2.91%	-13.87%	-14.38%
May-42	7.9600%	9.5600%	0.1900%	0.2375%	0.2500%	0.2438%	0.2583%	7.7700%	7.7163%	9.3017%	-6.14%	2.28%	2.93%	-8.42%	-9.07%
Jun-42	2.2100%	0.5700%	0.2100%	0.2375%	0.2508%	0.2442%	0.2600%	2.0000%	1.9658%	0.3100%	-9.31%	2.52%	2.93%	-11.83%	-12.24%
Jul-42	3.3700%	0.4000%	0.2100%	0.2358%	0.2492%	0.2425%	0.2583%	3.1600%	3.1275%	0.1417%	-11.38%	2.52%	2.91%	-13.90%	-14.29%
Aug-42	1.6400%	0.2600%	0.2100%	0.2342%	0.2492%	0.2417%	0.2583%	1.4300%	1.3983%	0.0017%	-10.02%	2.52%	2.90%	-12.54%	-12.92%
Sep-42	2.9000%	4.6600%	0.2000%	0.2333%	0.2483%	0.2408%	0.2567%	2.7000%	2.6592%	4.4033%	-6.78%	2.40%	2.89%	-9.18%	-9.67%
Oct-42	6.7800%	13.6200%	0.2100%	0.2333%	0.2458%	0.2396%	0.2567%	6.5700%	6.5404%	13.3633%	6.54%	2.52%	2.88%	4.02%	3.67%
Nov-42	-0.2100%	-0.1500%	0.2000%	0.2325%	0.2450%	0.2388%	0.2558%	-0.4100%	-0.4488%	-0.4058%	9.43%	2.40%	2.87%	7.03%	6.56%
Dec-42	5.4900%	3.2800%	0.2100%	0.2342%	0.2467%	0.2404%	0.2550%	5.2800%	5.2496%	3.0250%	20.33%	2.52%	2.89%	17.81%	17.45%
Jan-43	7.3700%	12.1700%	0.2000%	0.2325%	0.2442%	0.2383%	0.2542%	7.1700%	7.1317%	11.9158%	27.15%	2.40%	2.86%	24.75%	24.29%
Feb-43	5.8300%	7.1900%	0.1900%	0.2308%	0.2408%	0.2358%	0.2517%	5.6400%	5.5942%	6.9383%	36.74%	2.28%	2.83%	34.46%	33.91%
Mar-43	5.4500%	4.1200%	0.2100%	0.2300%	0.2400%	0.2350%	0.2508%	5.2400%	5.2150%	3.8692%	54.25%	2.52%	2.82%	51.73%	51.43%
Apr-43	0.3500%	3.8700%	0.2000%	0.2300%	0.2400%	0.2350%	0.2500%	0.1500%	0.1150%	3.6200%	61.24%	2.40%	2.82%	58.84%	58.42%
May-43	5.5200%	3.4700%	0.1900%	0.2283%	0.2392%	0.2338%	0.2500%	5.3300%	5.2863%	3.2200%	57.60%	2.28%	2.81%	55.32%	54.79%
Jun-43	2.2300%	5.3800%	0.2100%	0.2267%	0.2375%	0.2321%	0.2483%	2.0200%	1.9979%	5.1317%	57.63%	2.52%	2.79%	55.11%	54.84%
Jul-43	-5.2600%	0.3800%	0.2100%	0.2242%	0.2350%	0.2296%	0.2467%	-5.4700%	-5.4896%	0.1333%	44.47%	2.52%	2.76%	41.95%	41.71%
Aug-43	1.7100%	1.0500%	0.2100%	0.2242%	0.2342%	0.2292%	0.2467%	1.5000%	1.4808%	0.8033%	44.57%	2.52%	2.75%	42.05%	41.82%
Sep-43	2.6300%	3.2300%	0.2000%	0.2242%	0.2350%	0.2296%	0.2467%	2.4300%	2.4004%	2.9833%	44.19%	2.40%	2.76%	41.79%	41.43%
Oct-43	-1.0800%	0.8200%	0.2000%	0.2250%	0.2358%	0.2304%	0.2475%	-1.2800%	-1.3104%	0.5725%	33.57%	2.40%	2.77%	31.17%	30.81%
Nov-43	-6.5400%	-7.7500%	0.2100%	0.2258%	0.2367%	0.2313%	0.2483%	-6.7500%	-6.7713%	-7.9983%	25.10%	2.52%	2.78%	22.58%	22.33%
Dec-43	6.1700%	5.7800%	0.2100%	0.2283%	0.2392%	0.2338%	0.2492%	5.9600%	5.9363%	5.5308%	25.91%	2.52%	2.81%	23.39%	23.10%
Jan-44	1.7100%	1.0600%	0.2100%	0.2267%	0.2358%	0.2313%	0.2492%	1.5000%	1.4788%	0.8108%	19.27%	2.52%	2.78%	16.75%	16.50%
Feb-44	0.4200%	1.7900%	0.2000%	0.2283%	0.2358%	0.2321%	0.2492%	0.2200%	0.1879%	1.5408%	13.17%	2.40%	2.79%	10.77%	10.39%
Mar-44	1.9500%	1.0400%	0.2100%	0.2283%	0.2350%	0.2317%	0.2475%	1.7400%	1.7183%	0.7925%	9.42%	2.52%	2.78%	6.90%	6.64%
Apr-44	-1.0000%	-0.9100%	0.2000%	0.2283%	0.2350%	0.2317%	0.2492%	-1.2000%	-1.2317%	-1.1592%	7.94%	2.40%	2.78%	5.54%	5.16%
May-44	5.0500%	3.0100%	0.2200%	0.2275%	0.2342%	0.2308%	0.2492%	4.8300%	4.8192%	2.7608%	7.46%	2.64%	2.77%	4.82%	4.69%
Jun-44	5.4300%	5.2600%	0.2000%	0.2275%	0.2342%	0.2308%	0.2492%	5.2300%	5.1992%	5.0108%	10.83%	2.40%	2.77%	8.43%	8.06%
Jul-44	-1.9300%	0.2900%	0.2100%	0.2267%	0.2333%	0.2300%	0.2467%	-2.1400%	-2.1600%	0.0433%	14.72%	2.52%	2.76%	12.20%	11.96%
Aug-44	1.5700%	3.5700%	0.2100%	0.2258%	0.2325%	0.2292%	0.2450%	1.3600%	1.3408%	3.3250%	14.57%	2.52%	2.75%	12.05%	11.82%
Sep-44	-0.0800%	-1.5000%	0.2000%	0.2267%	0.2325%	0.2296%	0.2442%	-0.2800%	-0.3096%	-1.7442%	11.54%	2.40%	2.76%	9.14%	8.79%
Oct-44	0.2300%	1.3900%	0.2100%	0.2267%	0.2342%	0.2304%	0.2450%	0.0200%	-0.0004%	1.1450%	13.02%	2.52%	2.77%	10.50%	10.25%
Nov-44	1.3300%	-1.3000%	0.2000%	0.2267%	0.2333%	0.2300%	0.2467%	1.1300%	1.1000%	-1.5467%	22.53%	2.40%	2.76%	20.13%	19.77%
Dec-44	3.7400%	3.2400%	0.2000%	0.2250%	0.2300%	0.2275%	0.2475%	3.5400%	3.5125%	2.9925%	19.73%	2.40%	2.73%	17.33%	17.00%
Jan-45	1.5800%	4.9700%	0.2100%	0.2242%	0.2300%	0.2271%	0.2492%	1.3700%	1.3529%	4.7208%	19.58%	2.52%	2.73%	17.06%	16.85%
Feb-45	6.8300%	6.9500%	0.1800%	0.2208%	0.2275%	0.2242%	0.2483%	6.6500%	6.6058%	6.7017%	27.21%	2.16%	2.69%	25.05%	24.52%
Mar-45	-4.4100%	-3.5700%	0.2000%	0.2183%	0.2267%	0.2225%	0.2475%	-4.6100%	-4.6325%	-3.8175%	19.27%	2.40%	2.67%	16.87%	16.60%
Apr-45	9.0200%	10.6600%	0.1900%	0.2175%	0.2275%	0.2225%	0.2458%	8.8300%	8.7975%	10.4142%	31.35%	2.28%	2.67%	29.07%	28.68%
May-45	1.9500%	1.7100%	0.1900%	0.2183%	0.2267%	0.2225%	0.2433%	1.7600%	1.7275%	1.4667%	27.47%	2.28%	2.67%	25.19%	24.80%
Jun-45	-0.0700%	6.6200%	0.1900%	0.2175%	0.2242%	0.2208%	0.2392%	-0.2600%	-0.2908%	6.3808%	20.82%	2.28%	2.65%	18.54%	18.17%
Jul-45	-1.8000%	-0.5100%	0.1800%	0.2167%	0.2233%	0.2200%	0.2358%	-1.9800%	-2.0200%	-0.7458%	20.98%	2.16%	2.64%	18.82%	18.34%
Aug-45	6.4100%	0.3100%	0.1900%	0.2175%	0.2250%	0.2213%	0.2333%	6.2200%	6.1888%	0.0767%	26.75%	2.28%	2.66%	24.47%	24.09%
Sep-45	4.3800%	7.3900%	0.1800%	0.2183%	0.2250%	0.2217%	0.2325%	4.2000%	4.1583%	7.1575%	32.40%	2.16%	2.66%	30.24%	29.74%
Oct-45	3.2200%	6.4100%	0.1900%	0.2183%	0.2250%	0.2217%	0.2325%	3.0300%	2.9983%	6.1775%	36.35%	2.28%	2.66%	34.07%	33.69%
Nov-45	3.9600%	4.7100%	0.1800%	0.2183%	0.2233%	0.2208%	0.2308%	3.7800%	3.7392%	4.4792%	39.89%	2.16%	2.65%	37.73%	37.24%
Dec-45	1.1600%	-1.1700%	0.1800%	0.2175%	0.2233%	0.2204%	0.2292%	0.9800%	0.9396%	-1.3992%	36.41%	2.16%	2.65%	34.25%	33.77%

	Market Return	S&P Return	Ibbot LT RF	Aaa Corp	Aa Corp	Avg Aaa and Aa Corp	A PU	RPMKT	RPAAAAA	RPSPA	Mkt Annlized Return	RF Annualized Yield	AAAAA Annualized Yield	MRP RP	AAAAA RP
Jan-46	7.1400%	11.9900%	0.1700%	0.2117%	0.2183%	0.2150%	0.2242%	6.9700%	6.9250%	11.7658%	43.88%	2.04%	2.58%	41.84%	41.30%
Feb-46	-6.4100%	-6.4000%	0.1500%	0.2067%	0.2133%	0.2100%	0.2225%	-6.5600%	-6.6200%	-6.6225%	26.05%	1.80%	2.52%	24.25%	23.53%
Mar-46	4.8000%	6.3100%	0.1600%	0.2058%	0.2117%	0.2088%	0.2217%	4.6400%	4.5913%	6.0883%	38.19%	1.92%	2.51%	36.27%	35.69%
Apr-46	3.9300%	3.3800%	0.1700%	0.2050%	0.2133%	0.2092%	0.2208%	3.7600%	3.7208%	3.1592%	31.74%	2.04%	2.51%	29.70%	29.23%
May-46	2.8800%	3.0100%	0.1800%	0.2092%	0.2150%	0.2121%	0.2242%	2.7000%	2.6679%	2.7858%	32.94%	2.16%	2.55%	30.78%	30.40%
Jun-46	-3.7000%	-2.7600%	0.1600%	0.2075%	0.2158%	0.2117%	0.2250%	-3.8600%	-3.9117%	-2.9850%	28.11%	1.92%	2.54%	26.19%	25.57%
Jul-46	-2.3900%	-3.9500%	0.1900%	0.2067%	0.2158%	0.2113%	0.2242%	-2.5800%	-2.6013%	-4.1742%	27.34%	2.28%	2.54%	25.06%	24.81%
Aug-46	-6.7400%	-7.2400%	0.1700%	0.2092%	0.2183%	0.2138%	0.2258%	-6.9100%	-6.9538%	-7.4658%	11.61%	2.04%	2.57%	9.57%	9.04%
Sep-46	-9.9700%	-10.5100%	0.1800%	0.2150%	0.2233%	0.2192%	0.2292%	-10.1500%	-10.1892%	-10.7392%	-3.74%	2.16%	2.63%	-5.90%	-6.37%
Oct-46	-0.6000%	2.2000%	0.1900%	0.2167%	0.2250%	0.2208%	0.2300%	-0.7900%	-0.8208%	1.9700%	-7.30%	2.28%	2.65%	-9.58%	-9.95%
Nov-46	-0.2700%	0.5800%	0.1800%	0.2158%	0.2242%	0.2200%	0.2300%	-0.4500%	-0.4900%	0.3500%	-11.07%	2.16%	2.64%	-13.23%	-13.71%
Dec-46	4.5700%	7.0600%	0.1900%	0.2175%	0.2242%	0.2208%	0.2300%	4.3800%	4.3492%	6.8300%	-8.07%	2.28%	2.65%	-10.35%	-10.72%
Jan-47	2.5500%	-0.0200%	0.1800%	0.2142%	0.2208%	0.2175%	0.2267%	2.3700%	2.3325%	-0.2467%	-12.01%	2.16%	2.61%	-14.17%	-14.62%
Feb-47	-0.7700%	-0.8900%	0.1600%	0.2125%	0.2200%	0.2163%	0.2267%	-0.9300%	-0.9863%	-1.1167%	-6.71%	1.92%	2.60%	-8.63%	-9.31%
Mar-47	-1.4900%	-3.6400%	0.1800%	0.2125%	0.2200%	0.2163%	0.2267%	-1.6700%	-1.7063%	-3.8667%	-12.31%	2.16%	2.60%	-14.47%	-14.90%
Apr-47	-3.6300%	-3.2000%	0.1700%	0.2108%	0.2192%	0.2150%	0.2250%	-3.8000%	-3.8450%	-3.4250%	-18.69%	2.04%	2.58%	-20.73%	-21.27%
May-47	0.1400%	-2.7900%	0.1700%	0.2108%	0.2192%	0.2150%	0.2250%	-0.0300%	-0.0750%	-3.0150%	-20.85%	2.04%	2.58%	-22.89%	-23.43%
Jun-47	5.5400%	4.2800%	0.1900%	0.2125%	0.2200%	0.2163%	0.2258%	5.3500%	5.3238%	4.0542%	-13.26%	2.28%	2.60%	-15.54%	-15.85%
Jul-47	3.8100%	2.1400%	0.1800%	0.2125%	0.2200%	0.2163%	0.2275%	3.6300%	3.5938%	1.9125%	-7.75%	2.16%	2.60%	-9.91%	-10.34%
Aug-47	-2.0300%	-0.2200%	0.1700%	0.2133%	0.2200%	0.2167%	0.2275%	-2.2000%	-2.2467%	-0.4475%	-3.09%	2.04%	2.60%	-5.13%	-5.69%
Sep-47	-1.1100%	-1.4200%	0.1800%	0.2175%	0.2242%	0.2208%	0.2333%	-1.2900%	-1.3308%	-1.6533%	6.45%	2.16%	2.65%	4.29%	3.80%
Oct-47	2.3800%	-1.3300%	0.1800%	0.2250%	0.2325%	0.2288%	0.2400%	2.2000%	2.1513%	-1.5700%	9.64%	2.16%	2.75%	7.48%	6.89%
Nov-47	-1.7500%	-8.2400%	0.1700%	0.2308%	0.2375%	0.2342%	0.2442%	-1.9200%	-1.9842%	-8.4842%	8.01%	2.04%	2.81%	5.97%	5.20%
Dec-47	2.3300%	1.8900%	0.2100%	0.2383%	0.2450%	0.2417%	0.2542%	2.1200%	2.0883%	1.6358%	5.70%	2.52%	2.90%	3.18%	2.80%
Jan-48	-3.7900%	0.7000%	0.2000%	0.2383%	0.2450%	0.2417%	0.2542%	-3.9900%	-4.0317%	0.4458%	-0.84%	2.40%	2.90%	-3.24%	-3.74%
Feb-48	-3.8800%	-3.7200%	0.1900%	0.2375%	0.2442%	0.2408%	0.2542%	-4.0700%	-4.1208%	-3.9742%	-3.95%	2.28%	2.89%	-6.23%	-6.84%
Mar-48	7.9300%	6.1700%	0.2200%	0.2358%	0.2417%	0.2388%	0.2517%	7.7100%	7.6913%	5.9183%	5.24%	2.64%	2.87%	2.60%	2.37%
Apr-48	2.9200%	1.6000%	0.2000%	0.2317%	0.2392%	0.2354%	0.2475%	2.7200%	2.6846%	1.3525%	12.39%	2.40%	2.83%	9.99%	9.57%
May-48	8.7900%	5.8300%	0.1800%	0.2300%	0.2383%	0.2342%	0.2450%	8.6100%	8.5558%	5.5850%	22.10%	2.16%	2.81%	19.94%	19.29%
Jun-48	0.5400%	2.1200%	0.2100%	0.2300%	0.2375%	0.2338%	0.2450%	0.3300%	0.3063%	1.8750%	16.32%	2.52%	2.81%	13.80%	13.51%
Jul-48	-5.0800%	-4.4300%	0.1900%	0.2342%	0.2408%	0.2375%	0.2492%	-5.2700%	-5.3175%	-4.6792%	6.35%	2.28%	2.85%	4.07%	3.50%
Aug-48	1.5800%	0.3600%	0.2100%	0.2367%	0.2450%	0.2408%	0.2525%	1.3700%	1.3392%	0.1075%	10.27%	2.52%	2.89%	7.75%	7.38%
Sep-48	-2.7600%	-0.7100%	0.2000%	0.2367%	0.2442%	0.2404%	0.2542%	-2.9600%	-3.0004%	-0.9642%	8.43%	2.40%	2.89%	6.03%	5.55%
Oct-48	7.1000%	4.0300%	0.1900%	0.2367%	0.2450%	0.2408%	0.2525%	6.9100%	6.8592%	3.7775%	13.43%	2.28%	2.89%	11.15%	10.54%
Nov-48	-9.6100%	-9.1300%	0.2100%	0.2367%	0.2433%	0.2400%	0.2558%	-9.8200%	-9.8500%	-9.3858%	4.36%	2.52%	2.88%	1.84%	1.48%
Dec-48	3.4600%	2.2100%	0.2000%	0.2325%	0.2400%	0.2363%	0.2550%	3.2600%	3.2238%	1.9550%	5.51%	2.40%	2.84%	3.11%	2.68%
Jan-49	0.3900%	5.0400%	0.2000%	0.2258%	0.2342%	0.2300%	0.2492%	0.1900%	0.1600%	4.7908%	10.09%	2.40%	2.76%	7.69%	7.33%
Feb-49	-2.9600%	0.0500%	0.1800%	0.2258%	0.2333%	0.2296%	0.2492%	-3.1400%	-3.1896%	-0.1992%	11.15%	2.16%	2.76%	8.99%	8.39%
Mar-49	3.2800%	3.6400%	0.1900%	0.2250%	0.2325%	0.2288%	0.2475%	3.0900%	3.0513%	3.3925%	6.36%	2.28%	2.75%	4.08%	3.61%
Apr-49	-1.7900%	0.5800%	0.1800%	0.2250%	0.2325%	0.2288%	0.2467%	-1.9700%	-2.0188%	0.3333%	1.49%	2.16%	2.75%	-0.67%	-1.25%
May-49	-2.5800%	0.3400%	0.2000%	0.2258%	0.2317%	0.2288%	0.2458%	-2.7800%	-2.8088%	0.0942%	-9.11%	2.40%	2.75%	-11.51%	-11.86%
Jun-49	0.1400%	-1.3400%	0.1900%	0.2258%	0.2317%	0.2288%	0.2450%	-0.0500%	-0.0888%	-1.5850%	-9.48%	2.28%	2.75%	-11.76%	-12.22%
Jul-49	6.5000%	5.6900%	0.1700%	0.2225%	0.2292%	0.2258%	0.2417%	6.3300%	6.2742%	5.4483%	1.57%	2.04%	2.71%	-0.47%	-1.14%
Aug-49	2.1900%	3.4600%	0.1900%	0.2183%	0.2258%	0.2221%	0.2383%	2.0000%	1.9679%	3.2217%	2.18%	2.28%	2.67%	-0.10%	-0.49%
Sep-49	2.6300%	3.7300%	0.1700%	0.2167%	0.2242%	0.2204%	0.2375%	2.4600%	2.4096%	3.4925%	7.84%	2.04%	2.65%	5.80%	5.20%
Oct-49	3.4000%	1.1200%	0.1800%	0.2175%	0.2250%	0.2213%	0.2358%	3.2200%	3.1788%	0.8842%	4.12%	2.16%	2.66%	1.96%	1.46%
Nov-49	1.7500%	1.5900%	0.1700%	0.2167%	0.2233%	0.2200%	0.2342%	1.5800%	1.5300%	1.3558%	17.20%	2.04%	2.64%	15.16%	14.56%
Dec-49	4.8600%	3.9600%	0.1700%	0.2150%	0.2225%	0.2188%	0.2317%	4.6900%	4.6413%	3.7283%	18.79%	2.04%	2.63%	16.75%	16.16%
Jan-50	1.9700%	3.5300%	0.1800%	0.2142%	0.2208%	0.2175%	0.2300%	1.7900%	1.7525%	3.3000%	20.66%	2.16%	2.61%	18.50%	18.05%
Feb-50	1.9900%	1.0000%	0.1600%	0.2150%	0.2208%	0.2179%	0.2300%	1.8300%	1.7721%	0.7700%	26.81%	1.92%	2.62%	24.89%	24.20%
Mar-50	0.7000%	0.8400%	0.1800%	0.2150%	0.2217%	0.2183%	0.2300%	0.5200%	0.4817%	0.6100%	23.64%	2.16%	2.62%	21.48%	21.02%
Apr-50	4.8600%	1.8500%	0.1600%	0.2167%	0.2217%	0.2192%	0.2308%	4.7000%	4.6408%	1.6192%	32.01%	1.92%	2.63%	30.09%	29.38%
May-50	5.0900%	1.9200%	0.1900%	0.2175%	0.2242%	0.2208%	0.2325%	4.9000%	4.8692%	1.6875%	42.41%	2.28%	2.65%	40.13%	39.76%
Jun-50	-5.4800%	-7.7100%	0.1700%	0.2183%	0.2242%	0.2213%	0.2325%	-5.6500%	-5.7013%	-7.9425%	34.42%	2.04%	2.66%	32.38%	31.76%
Jul-50	1.1900%	-4.3600%	0.1800%	0.2208%	0.2267%	0.2238%	0.2325%	1.0100%	0.9663%	-4.5925%	27.71%	2.16%	2.69%	25.55%	25.03%
Aug-50	4.4300%	1.5400%	0.1800%	0.2175%	0.2225%	0.2200%	0.2300%	4.2500%	4.2100%	1.3100%	30.51%	2.16%	2.64%	28.35%	27.87%
Sep-50	5.9200%	4.1800%	0.1700%	0.2200%	0.2258%	0.2229%	0.2333%	5.7500%	5.6971%	3.9467%	34.70%	2.04%	2.68%	32.66%	32.02%
Oct-50	0.9300%	-0.2700%	0.1900%	0.2225%	0.2267%	0.2246%	0.2358%	0.7400%	0.7054%	-0.5058%	31.48%	2.28%	2.70%	29.20%	28.79%
Nov-50	1.6900%	-1.7600%	0.1800%	0.2225%	0.2267%	0.2246%	0.2383%	1.5100%	1.4654%	-1.9983%	31.40%	2.16%	2.70%	29.24%	28.71%
Dec-50	5.1300%	3.1200%	0.1800%	0.2225%	0.2267%	0.2246%	0.2383%	4.9500%	4.9054%	2.8817%	31.74%	2.16%	2.70%	29.58%	29.05%
Jan-51	6.3700%	4.3800%	0.2000%	0.2217%	0.2258%	0.2238%	0.2358%	6.1700%	6.1463%	4.1442%	37.43%	2.40%	2.69%	35.03%	34.74%
Feb-51	1.5700%	2.6800%	0.1700%	0.2217%	0.2258%	0.2238%	0.2367%	1.4000%	1.3463%	2.4433%	36.86%	2.04%	2.69%	34.82%	34.17%
Mar-51	-1.5600%	-1.7400%	0.1900%	0.2317%	0.2350%	0.2333%	0.2458%	-1.7500%	-1.7933%	-1.9858%	33.79%	2.28%	2.80%	31.51%	30.99%
Apr-51	5.0900%	0.0500%	0.2000%	0.2392%	0.2442%	0.2417%	0.2575%	4.8900%	4.8483%	-0.2075%	34.08%	2.40%	2.90%	31.68%	31.18%
May-51	-2.9900%	0.6600%	0.2100%	0.2408%	0.2442%	0.2425%	0.2608%	-3.2000%	-3.2325%	0.3992%	23.77%	2.52%	2.91%	21.25%	20.86%
Jun-51	-2.2800%	-0.4000%	0.2000%	0.2450%	0.2492%	0.2471%	0.2675%	-2.4800%	-2.5271%	-0.6675%	27.96%	2.40%	2.97%	25.56%	25.00%
Jul-51	7.1100%	4.3900%	0.2300%	0.2450%	0.2492%	0.2471%	0.2717%	6.8800%	6.8629%	4.1183%	35.45%	2.76%	2.97%	32.69%	32.48%
Aug-51	4.7800%	1.5200%	0.2100%	0.2400%	0.2433%	0.2417%	0.2658%	4.5700%	4.5383%	1.2542%	35.90%	2.52%	2.90%	33.38%	33.00%
Sep-51	0.1300%	0.8600%	0.1900%	0.2367%	0.2400%	0.2383%	0.2617%	-0.0600%	-0.1083%	0.5983%	28.47%	2.28%	2.86%	26.19%	25.61%
Oct-51	-1.0300%	0.2900%	0.2300%	0.2408%	0.2442%	0.2425%	0.2642%	-1.2600%	-1.2725%	0.0258%	25.98%	2.76%	2.91%	23.22%	23.07%
Nov-51	0.9600%	1.2000%	0.2100%	0.2467%	0.2517%	0.2492%	0.2700%	0.7500%	0.7108%	0.9300%	25.07%	2.52%	2.99%	22.55%	22.08%
Dec-51	4.2400%	3.5200%	0.2200%	0.2508%	0.2550%	0.2529%	0.2742%	4.0200%	3.9871%	3.2458%	24.02%	2.64%	3.04%	21.38%	20.98%
Jan-52	1.8100%	3.0500%	0.2300%	0.2483%	0.2542%	0.2513%	0.2742%	1.5800%	1.5588%	2.7758%	18.70%	2.76%	3.02%	15.94%	15.68%
Feb-52	-2.8200%	0.5900%	0.2100%	0.2442%	0.2508%	0.2475%	0.2692%	-3.0300%	-3.0675%	0.3208%	13.57%	2.52%	2.97%	11.05%	10.60%
Mar-52	5.0300%	1.7600%	0.2300%	0.2467%	0.2525%	0.2496%	0.2708%	4.8000%	4.7804%	1.4892%	21.17%	2.76%	3.00%	18.41%	18.18%
Apr-52	-4.0200%	-1.5400%	0.2200%	0.2442%	0.2508%	0.2475%	0.2692%	-4.2400%	-4.2675%	-1.8092%	10.67%	2.64%	2.97%	8.03%	7.70%
May-52	3.4300%	1.9000%	0.2000%	0.2442%	0.2500%	0.2471%	0.2683%	3.2300%	3.1829%	1.6317%	17.99%	2.40%	2.97%	15.59%	15.03%
Jun-52	4.9000%	0.4900%	0.2200%	0.2450%	0.2525%	0.2488%	0.2683%	4.6800%	4.6513%	0.2217%	26.66%	2.64%	2.99%	24.02%	23.68%
Jul-52	1.9600%	2.0600%	0.2200%	0.2458%	0.2533%	0.2496%	0.2683%	1.7400%	1.7104%	1.7917%	20.57%	2.64%	3.00%	17.93%	17.58%
Aug-52	-0.7100%	2.0300%	0.2100%	0.2450%	0.2550%	0.2500%	0.2700%	-0.9200%	-0.9600%	1.7600%	14.25%	2.52%	3.00%	11.73%	11.25%
Sep-52	-1.7600%	0.1500%	0.2300%	0.2458%	0.2558%	0.2508%	0.2700%	-1.9900%	-2.0108%	-0.1200%	12.10%	2.76%	3.01%	9.34%	9.09%

	Market Return	S&P Return	Ibbot LT RF	Aaa Corp	Aa Corp	Avg Aaa and Aa Corp	A PU	RPMKT	RPAAAAA	RPSPA	Mkt Annlized Return	RF Annualized Yield	AAAAA Annualized Yield	MRP RP	AAAAA RP
Oct-52	0.2000%	1.0100%	0.2300%	0.2508%	0.2567%	0.2538%	0.2717%	-0.0300%	-0.0538%	0.7383%	13.49%	2.76%	3.05%	10.73%	10.45%
Nov-52	5.7100%	4.2300%	0.2100%	0.2483%	0.2550%	0.2517%	0.2700%	5.5000%	5.4583%	3.9600%	18.83%	2.52%	3.02%	16.31%	15.81%
Dec-52	3.8200%	2.1300%	0.2400%	0.2475%	0.2542%	0.2508%	0.2683%	3.5800%	3.5692%	1.8617%	18.35%	2.88%	3.01%	15.47%	15.34%
Jan-53	-0.4900%	1.0300%	0.2300%	0.2517%	0.2575%	0.2546%	0.2708%	-0.7200%	-0.7446%	0.7592%	15.68%	2.76%	3.06%	12.92%	12.62%
Feb-53	-1.0600%	-0.6700%	0.2100%	0.2558%	0.2617%	0.2588%	0.2750%	-1.2700%	-1.3188%	-0.9450%	17.77%	2.52%	3.11%	15.25%	14.67%
Mar-53	-2.1200%	-0.4300%	0.2500%	0.2600%	0.2650%	0.2625%	0.2800%	-2.3700%	-2.3825%	-0.7100%	9.75%	3.00%	3.15%	6.75%	6.60%
Apr-53	-2.3700%	-1.9200%	0.2400%	0.2692%	0.2742%	0.2717%	0.2892%	-2.6100%	-2.6417%	-2.2092%	11.64%	2.88%	3.26%	8.76%	8.38%
May-53	0.7700%	0.2400%	0.2400%	0.2783%	0.2842%	0.2813%	0.3025%	0.5300%	0.4888%	-0.0625%	8.77%	2.88%	3.38%	5.89%	5.40%
Jun-53	-1.3400%	-2.7300%	0.2700%	0.2833%	0.2917%	0.2875%	0.3092%	-1.6100%	-1.6275%	-3.0392%	2.30%	3.24%	3.45%	-0.94%	-1.15%
Jul-53	2.7300%	3.4500%	0.2500%	0.2733%	0.2850%	0.2792%	0.3050%	2.4800%	2.4508%	3.1450%	3.07%	3.00%	3.35%	0.07%	-0.28%
Aug-53	-5.0100%	0.1600%	0.2500%	0.2700%	0.2825%	0.2763%	0.3008%	-5.2600%	-5.2863%	-0.1408%	-1.39%	3.00%	3.32%	-4.39%	-4.71%
Sep-53	0.3400%	1.1900%	0.2500%	0.2742%	0.2858%	0.2800%	0.3017%	0.0900%	0.0600%	0.8883%	0.72%	3.00%	3.36%	-2.28%	-2.64%
Oct-53	5.4000%	4.1100%	0.2300%	0.2633%	0.2775%	0.2704%	0.2908%	5.1700%	5.1296%	3.8192%	5.94%	2.76%	3.25%	3.18%	2.70%
Nov-53	2.0400%	2.7400%	0.2400%	0.2592%	0.2725%	0.2658%	0.2833%	1.8000%	1.7742%	2.4567%	2.27%	2.88%	3.19%	-0.61%	-0.92%
Dec-53	0.5300%	0.6400%	0.2400%	0.2608%	0.2733%	0.2671%	0.2817%	0.2900%	0.2629%	0.3583%	-0.98%	2.88%	3.21%	-3.86%	-4.18%
Jan-54	5.3600%	3.2700%	0.2300%	0.2550%	0.2683%	0.2617%	0.2767%	5.1300%	5.0983%	2.9933%	4.85%	2.76%	3.14%	2.09%	1.71%
Feb-54	1.1100%	1.1700%	0.2200%	0.2458%	0.2600%	0.2529%	0.2692%	0.8900%	0.8571%	0.9008%	7.15%	2.64%	3.04%	4.51%	4.11%
Mar-54	3.2500%	2.7000%	0.2500%	0.2383%	0.2525%	0.2454%	0.2633%	3.0000%	3.0046%	2.4367%	13.02%	3.00%	2.95%	10.02%	10.08%
Apr-54	5.1600%	1.2100%	0.2200%	0.2375%	0.2500%	0.2438%	0.2633%	4.9400%	4.9163%	0.9467%	21.74%	2.64%	2.93%	19.10%	18.82%
May-54	4.1800%	2.5700%	0.2000%	0.2400%	0.2525%	0.2463%	0.2617%	3.9800%	3.9338%	2.3083%	25.86%	2.40%	2.96%	23.46%	22.91%
Jun-54	0.3100%	0.9600%	0.2500%	0.2417%	0.2550%	0.2483%	0.2633%	0.0600%	0.0617%	0.6967%	27.97%	3.00%	2.98%	24.97%	24.99%
Jul-54	5.8900%	4.9500%	0.2200%	0.2408%	0.2533%	0.2471%	0.2617%	5.6700%	5.6429%	4.6883%	31.90%	2.64%	2.97%	29.26%	28.94%
Aug-54	-2.7500%	-1.3100%	0.2300%	0.2392%	0.2525%	0.2458%	0.2608%	-2.9800%	-2.9958%	-1.5708%	35.04%	2.76%	2.95%	32.28%	32.09%
Sep-54	8.5100%	1.7800%	0.2200%	0.2408%	0.2533%	0.2471%	0.2600%	8.2900%	8.2629%	1.5200%	46.04%	2.64%	2.97%	43.40%	43.07%
Oct-54	-1.6700%	-3.6800%	0.2100%	0.2392%	0.2533%	0.2463%	0.2600%	-1.8800%	-1.9163%	-3.9400%	36.24%	2.52%	2.96%	33.72%	33.29%
Nov-54	9.0900%	5.6500%	0.2300%	0.2408%	0.2533%	0.2471%	0.2592%	8.8600%	8.8429%	5.3908%	45.65%	2.76%	2.97%	42.89%	42.69%
Dec-54	5.3400%	3.4100%	0.2300%	0.2417%	0.2533%	0.2475%	0.2592%	5.1100%	5.0925%	3.1508%	52.62%	2.76%	2.97%	49.86%	49.65%
Jan-55	1.9700%	1.4300%	0.2200%	0.2442%	0.2550%	0.2496%	0.2608%	1.7500%	1.7204%	1.1692%	47.71%	2.64%	3.00%	45.07%	44.72%
Feb-55	0.9800%	3.4400%	0.2200%	0.2442%	0.2583%	0.2513%	0.2617%	0.7600%	0.7288%	3.1783%	47.52%	2.64%	3.02%	44.88%	44.51%
Mar-55	-0.3000%	-1.1000%	0.2400%	0.2517%	0.2608%	0.2563%	0.2625%	-0.5400%	-0.5563%	-1.3625%	42.45%	2.88%	3.08%	39.57%	39.37%
Apr-55	3.9600%	2.0200%	0.2200%	0.2508%	0.2608%	0.2558%	0.2625%	3.7400%	3.7042%	1.7575%	40.82%	2.64%	3.07%	38.18%	37.75%
May-55	0.5500%	-0.5800%	0.2500%	0.2533%	0.2625%	0.2579%	0.2658%	0.3000%	0.2921%	-0.8458%	35.92%	3.00%	3.10%	32.92%	32.82%
Jun-55	8.4100%	2.1100%	0.2300%	0.2542%	0.2617%	0.2579%	0.2675%	8.1800%	8.1521%	1.8425%	46.89%	2.76%	3.10%	44.13%	43.80%
Jul-55	6.2200%	4.6600%	0.2300%	0.2550%	0.2617%	0.2583%	0.2675%	5.9900%	5.9617%	4.3925%	47.35%	2.76%	3.10%	44.59%	44.25%
Aug-55	-0.2500%	0.5200%	0.2700%	0.2592%	0.2667%	0.2629%	0.2700%	-0.5200%	-0.5129%	0.2500%	51.14%	3.24%	3.16%	47.90%	47.98%
Sep-55	1.3000%	-2.9000%	0.2400%	0.2608%	0.2683%	0.2646%	0.2725%	1.0600%	1.0354%	-3.1725%	41.10%	2.88%	3.18%	38.22%	37.92%
Oct-55	-2.8400%	-0.8500%	0.2500%	0.2583%	0.2658%	0.2621%	0.2750%	-3.0900%	-3.1021%	-1.1250%	39.42%	3.00%	3.15%	36.42%	36.27%
Nov-55	8.2700%	2.9200%	0.2400%	0.2583%	0.2650%	0.2617%	0.2767%	8.0300%	8.0083%	2.6433%	38.37%	2.88%	3.14%	35.49%	35.23%
Dec-55	0.1500%	-0.6700%	0.2400%	0.2625%	0.2683%	0.2654%	0.2792%	-0.0900%	-0.1154%	-0.9492%	31.55%	2.88%	3.19%	28.67%	28.37%
Jan-56	-3.4700%	0.3000%	0.2500%	0.2592%	0.2658%	0.2625%	0.2758%	-3.7200%	-3.7325%	0.0242%	24.53%	3.00%	3.15%	21.53%	21.38%
Feb-56	4.1300%	1.7800%	0.2300%	0.2567%	0.2633%	0.2600%	0.2742%	3.9000%	3.8700%	1.5058%	28.42%	2.76%	3.12%	25.66%	25.30%
Mar-56	7.1000%	3.9400%	0.2300%	0.2583%	0.2650%	0.2617%	0.2742%	6.8700%	6.8383%	3.6658%	37.95%	2.76%	3.14%	35.19%	34.81%
Apr-56	-0.0400%	-2.8700%	0.2600%	0.2700%	0.2750%	0.2725%	0.2833%	-0.3000%	-0.3125%	-3.1533%	32.64%	3.12%	3.27%	29.52%	29.37%
May-56	-5.9300%	-1.3800%	0.2600%	0.2733%	0.2783%	0.2758%	0.2900%	-6.1900%	-6.2058%	-1.6700%	24.09%	3.12%	3.31%	20.97%	20.78%
Jun-56	4.0900%	2.1100%	0.2300%	0.2717%	0.2792%	0.2754%	0.2908%	3.8600%	3.8146%	1.8192%	19.15%	2.76%	3.31%	16.39%	15.84%
Jul-56	5.3000%	5.2500%	0.2600%	0.2733%	0.2825%	0.2779%	0.2958%	5.0400%	5.0221%	4.9542%	18.12%	3.12%	3.34%	15.00%	14.78%
Aug-56	-3.2800%	-2.5900%	0.2600%	0.2858%	0.2917%	0.2888%	0.3025%	-3.5400%	-3.5688%	-2.8925%	14.53%	3.12%	3.47%	11.41%	11.06%
Sep-56	-4.4000%	-3.1900%	0.2500%	0.2967%	0.3025%	0.2996%	0.3100%	-4.6500%	-4.6996%	-3.5000%	8.08%	3.00%	3.60%	5.08%	4.49%
Oct-56	0.6600%	0.6300%	0.2900%	0.2992%	0.3075%	0.3033%	0.3158%	0.3700%	0.3567%	0.3142%	11.98%	3.48%	3.64%	8.50%	8.34%
Nov-56	-0.5000%	0.2800%	0.2700%	0.3075%	0.3133%	0.3104%	0.3183%	-0.7700%	-0.8104%	-0.0383%	2.91%	3.24%	3.73%	-0.33%	-0.82%
Dec-56	3.7000%	1.0400%	0.2800%	0.3125%	0.3208%	0.3167%	0.3258%	3.4200%	3.3833%	0.7142%	6.56%	3.36%	3.80%	3.20%	2.76%
Jan-57	-4.0100%	3.2400%	0.2900%	0.3142%	0.3242%	0.3192%	0.3300%	-4.3000%	-4.3292%	2.9100%	5.96%	3.48%	3.83%	2.48%	2.13%
Feb-57	-2.6400%	-0.6100%	0.2500%	0.3058%	0.3192%	0.3125%	0.3375%	-2.8900%	-2.9525%	-0.9475%	-0.93%	3.00%	3.75%	-3.93%	-4.68%
Mar-57	2.1500%	0.7800%	0.2600%	0.3050%	0.3167%	0.3108%	0.3375%	1.8900%	1.8392%	0.4425%	-5.51%	3.12%	3.73%	-8.63%	-9.24%
Apr-57	3.8800%	4.0200%	0.2900%	0.3058%	0.3158%	0.3108%	0.3342%	3.5900%	3.5692%	3.6858%	-1.80%	3.48%	3.73%	-5.28%	-5.53%
May-57	4.3700%	1.8000%	0.2900%	0.3117%	0.3192%	0.3154%	0.3342%	4.0800%	4.0546%	1.4658%	8.95%	3.48%	3.79%	5.47%	5.16%
Jun-57	0.0400%	-4.1800%	0.2500%	0.3258%	0.3317%	0.3288%	0.3408%	-0.2100%	-0.2888%	-4.5208%	4.71%	3.00%	3.95%	1.71%	0.76%
Jul-57	1.3100%	0.3500%	0.3300%	0.3325%	0.3417%	0.3371%	0.3500%	0.9800%	0.9729%	0.0000%	0.74%	3.96%	4.05%	-3.22%	-3.30%
Aug-57	-5.0500%	-2.9400%	0.3000%	0.3417%	0.3508%	0.3463%	0.3642%	-5.3500%	-5.3963%	-3.3042%	-1.10%	3.60%	4.16%	-4.70%	-5.26%
Sep-57	-6.0200%	-1.3800%	0.3100%	0.3433%	0.3550%	0.3492%	0.3792%	-6.3300%	-6.3692%	-1.7592%	-2.78%	3.72%	4.19%	-6.50%	-6.97%
Oct-57	-3.0200%	-0.7400%	0.3100%	0.3417%	0.3567%	0.3492%	0.3842%	-3.3300%	-3.3692%	-1.1242%	-6.33%	3.72%	4.19%	-10.05%	-10.52%
Nov-57	2.3100%	4.2800%	0.2900%	0.3400%	0.3575%	0.3488%	0.3850%	2.0200%	1.9613%	3.8950%	-3.69%	3.48%	4.19%	-7.17%	-7.87%
Dec-57	-3.9500%	1.9500%	0.2900%	0.3175%	0.3400%	0.3288%	0.3633%	-4.2400%	-4.2788%	1.5867%	-10.79%	3.48%	3.95%	-14.27%	-14.74%
Jan-58	4.4500%	6.0200%	0.2700%	0.3000%	0.3175%	0.3088%	0.3275%	4.1800%	4.1413%	5.6925%	-2.93%	3.24%	3.71%	-6.17%	-6.63%
Feb-58	-1.4100%	1.3700%	0.2500%	0.2992%	0.3142%	0.3067%	0.3300%	-1.6600%	-1.7167%	1.0400%	-1.70%	3.00%	3.68%	-4.70%	-5.38%
Mar-58	3.2800%	2.0000%	0.2700%	0.3025%	0.3150%	0.3088%	0.3442%	3.0100%	2.9713%	1.6558%	-0.62%	3.24%	3.71%	-3.86%	-4.32%
Apr-58	3.3700%	5.1600%	0.2600%	0.3000%	0.3150%	0.3075%	0.3292%	3.1100%	3.0625%	4.8308%	-1.10%	3.12%	3.69%	-4.22%	-4.79%
May-58	2.1200%	1.6400%	0.2400%	0.2975%	0.3150%	0.3063%	0.3342%	1.8800%	1.8138%	1.3058%	-3.24%	2.88%	3.68%	-6.12%	-6.91%
Jun-58	2.7900%	1.7200%	0.2700%	0.2975%	0.3150%	0.3063%	0.3325%	2.5200%	2.4838%	1.3875%	-0.58%	3.24%	3.68%	-3.82%	-4.25%
Jul-58	4.4900%	1.0900%	0.2700%	0.3058%	0.3192%	0.3125%	0.3367%	4.2200%	4.1775%	0.7533%	2.55%	3.24%	3.75%	-0.69%	-1.20%
Aug-58	1.7600%	-0.6700%	0.2700%	0.3208%	0.3317%	0.3263%	0.3575%	1.4900%	1.4338%	-1.0275%	9.90%	3.24%	3.92%	6.66%	5.99%
Sep-58	5.0100%	3.3200%	0.3200%	0.3408%	0.3500%	0.3454%	0.3792%	4.6900%	4.6646%	2.9408%	22.80%	3.84%	4.15%	18.96%	18.65%
Oct-58	2.7000%	4.0600%	0.3200%	0.3425%	0.3508%	0.3467%	0.3800%	2.3800%	2.3533%	3.6800%	30.04%	3.84%	4.16%	26.20%	25.88%
Nov-58	2.8400%	2.6300%	0.2800%	0.3408%	0.3508%	0.3458%	0.3725%	2.5600%	2.4942%	2.2575%	30.72%	3.36%	4.15%	27.36%	26.57%
Dec-58	5.3500%	6.5500%	0.3300%	0.3400%	0.3483%	0.3442%	0.3742%	5.0200%	5.0058%	6.1758%	43.37%	3.96%	4.13%	39.41%	39.24%
Jan-59	0.5300%	1.3400%	0.3100%	0.3433%	0.3517%	0.3475%	0.3767%	0.2200%	0.1825%	0.9633%	37.99%	3.72%	4.17%	34.27%	33.82%
Feb-59	0.4900%	2.0600%	0.3100%	0.3450%	0.3533%	0.3492%	0.3750%	0.1800%	0.1408%	1.6850%	40.65%	3.72%	4.19%	36.93%	36.46%
Mar-59	0.2000%	1.0200%	0.3500%	0.3442%	0.3525%	0.3483%	0.3725%	-0.1500%	-0.1483%	0.6475%	36.46%	4.20%	4.18%	32.26%	32.28%
Apr-59	4.0200%	-0.2800%	0.3300%	0.3525%	0.3600%	0.3563%	0.3800%	3.6900%	3.6638%	-0.6600%	37.31%	3.96%	4.28%	33.35%	33.04%
May-59	2.4000%	-1.2000%	0.3300%	0.3642%	0.3717%	0.3679%	0.3975%	2.0700%	2.0321%	-1.5975%	37.69%	3.96%	4.42%	33.73%	33.28%
Jun-59	-0.2200%	-0.8800%	0.3600%	0.3717%	0.3800%	0.3758%	0.4050%	-0.5800%	-0.5958%	-1.2850%	33.66%	4.32%	4.51%	29.34%	29.15%

	Market Return	S&P Return	Ibbot LT RF	Aaa Corp	Aa Corp	Avg Aaa and Aa Corp	A PU	RPMKT	RPAAAAA	RPSPA	Mkt Annlized Return	RF Annualized Yield	AAAAA Annualized Yield	MRP RP	AAAAA RP
Jul-59	3.6300%	3.7100%	0.3500%	0.3725%	0.3817%	0.3771%	0.4067%	3.2800%	3.2529%	3.3033%	32.56%	4.20%	4.53%	28.36%	28.03%
Aug-59	-1.0200%	1.7500%	0.3500%	0.3692%	0.3817%	0.3754%	0.4075%	-1.3700%	-1.3954%	1.3425%	28.94%	4.20%	4.51%	24.74%	24.43%
Sep-59	-4.4300%	-3.9300%	0.3400%	0.3767%	0.3908%	0.3838%	0.4192%	-4.7700%	-4.8138%	-4.3492%	17.35%	4.08%	4.61%	13.27%	12.74%
Oct-59	1.2800%	1.5700%	0.3500%	0.3808%	0.3967%	0.3888%	0.4133%	0.9300%	0.8913%	1.1567%	15.72%	4.20%	4.67%	11.52%	11.06%
Nov-59	1.8600%	0.0100%	0.3500%	0.3800%	0.3917%	0.3858%	0.4083%	1.5100%	1.4742%	-0.3983%	14.62%	4.20%	4.63%	10.42%	9.99%
Dec-59	2.9200%	2.3000%	0.3600%	0.3817%	0.3950%	0.3883%	0.4133%	2.5600%	2.5317%	1.8867%	11.98%	4.32%	4.66%	7.66%	7.32%
Jan-60	-7.0000%	-1.0800%	0.3500%	0.3842%	0.3975%	0.3908%	0.4183%	-7.3500%	-7.3908%	-1.4983%	3.59%	4.20%	4.69%	-0.61%	-1.10%
Feb-60	1.4700%	1.8100%	0.3700%	0.3800%	0.3925%	0.3863%	0.4167%	1.1000%	1.0838%	1.3933%	4.60%	4.44%	4.64%	0.16%	-0.04%
Mar-60	-1.2300%	1.4100%	0.3600%	0.3742%	0.3850%	0.3796%	0.4092%	-1.5900%	-1.6096%	1.0008%	3.11%	4.32%	4.56%	-1.21%	-1.45%
Apr-60	-1.6100%	0.7500%	0.3200%	0.3708%	0.3817%	0.3763%	0.3992%	-1.9300%	-1.9863%	0.3508%	-2.47%	3.84%	4.52%	-6.31%	-6.99%
May-60	3.2600%	2.3300%	0.3700%	0.3717%	0.3842%	0.3779%	0.4050%	2.8900%	2.8821%	1.9250%	-1.65%	4.44%	4.54%	-6.09%	-6.19%
Jun-60	2.1100%	4.0800%	0.3400%	0.3708%	0.3833%	0.3771%	0.4033%	1.7700%	1.7329%	3.6767%	0.64%	4.08%	4.53%	-3.44%	-3.88%
Jul-60	-2.3400%	-1.0000%	0.3200%	0.3675%	0.3800%	0.3738%	0.3992%	-2.6600%	-2.7138%	-1.3992%	-5.16%	3.84%	4.49%	-9.00%	-9.64%
Aug-60	3.1700%	5.0200%	0.3400%	0.3567%	0.3700%	0.3633%	0.3867%	2.8300%	2.8067%	4.6333%	-1.14%	4.08%	4.36%	-5.22%	-5.50%
Sep-60	-5.9000%	-5.1400%	0.3200%	0.3542%	0.3675%	0.3608%	0.3808%	-6.2200%	-6.2608%	-5.5208%	-2.66%	3.84%	4.33%	-6.50%	-6.99%
Oct-60	-0.0700%	-0.1200%	0.3300%	0.3583%	0.3700%	0.3642%	0.3842%	-0.4000%	-0.4342%	-0.5042%	-3.96%	3.96%	4.37%	-7.92%	-8.33%
Nov-60	4.6500%	3.8600%	0.3200%	0.3592%	0.3725%	0.3658%	0.3851%	4.3300%	4.2842%	3.4749%	-1.33%	3.84%	4.39%	-5.17%	-5.72%
Dec-60	4.7900%	7.2400%	0.3300%	0.3625%	0.3750%	0.3688%	0.3875%	4.4600%	4.4213%	6.8525%	0.46%	3.96%	4.43%	-3.50%	-3.96%
Jan-61	6.4500%	6.1900%	0.3300%	0.3600%	0.3733%	0.3667%	0.3867%	6.1200%	6.0833%	5.8033%	14.99%	3.96%	4.40%	11.03%	10.59%
Feb-61	3.1900%	3.5700%	0.3000%	0.3558%	0.3667%	0.3613%	0.3825%	2.8900%	2.8288%	3.1875%	16.94%	3.60%	4.34%	13.34%	12.61%
Mar-61	2.7000%	3.1900%	0.3100%	0.3517%	0.3608%	0.3563%	0.3733%	2.3900%	2.3438%	2.8167%	21.60%	3.72%	4.28%	17.88%	17.32%
Apr-61	0.5100%	1.0900%	0.3100%	0.3542%	0.3642%	0.3592%	0.3733%	0.2000%	0.1508%	0.7167%	24.22%	3.72%	4.31%	20.50%	19.91%
May-61	2.3900%	1.3300%	0.3400%	0.3558%	0.3675%	0.3617%	0.3767%	2.0500%	2.0283%	0.9533%	23.17%	4.08%	4.34%	19.09%	18.83%
Jun-61	-2.7500%	-2.2700%	0.3200%	0.3608%	0.3708%	0.3658%	0.3808%	-3.0700%	-3.1158%	-2.6508%	17.31%	3.84%	4.39%	13.47%	12.92%
Jul-61	3.4200%	4.2400%	0.3300%	0.3675%	0.3775%	0.3725%	0.3875%	3.0900%	3.0475%	3.8525%	24.23%	3.96%	4.47%	20.27%	19.76%
Aug-61	2.4300%	4.5400%	0.3300%	0.3708%	0.3808%	0.3758%	0.3942%	2.1000%	2.0542%	4.1458%	23.34%	3.96%	4.51%	19.38%	18.83%
Sep-61	-1.8400%	-0.6700%	0.3200%	0.3708%	0.3825%	0.3767%	0.3942%	-2.1600%	-2.2167%	-1.0642%	28.66%	3.84%	4.52%	24.82%	24.14%
Oct-61	2.9800%	4.8000%	0.3400%	0.3683%	0.3800%	0.3742%	0.3925%	2.6400%	2.6058%	4.4075%	32.58%	4.08%	4.49%	28.50%	28.09%
Nov-61	4.4700%	3.3500%	0.3200%	0.3658%	0.3783%	0.3721%	0.3900%	4.1500%	4.0979%	2.9600%	32.36%	3.84%	4.47%	28.52%	27.89%
Dec-61	0.4600%	-2.9200%	0.3100%	0.3683%	0.3800%	0.3742%	0.3875%	0.1500%	0.0858%	-3.3075%	26.89%	3.72%	4.49%	23.17%	22.40%
Jan-62	-3.6600%	-3.6600%	0.3700%	0.3683%	0.3792%	0.3738%	0.3875%	-4.0300%	-4.0338%	-4.0475%	14.84%	4.44%	4.49%	10.40%	10.35%
Feb-62	2.0900%	3.0000%	0.3200%	0.3683%	0.3800%	0.3742%	0.3883%	1.7700%	1.7158%	2.6117%	13.61%	3.84%	4.49%	9.77%	9.12%
Mar-62	-0.4600%	0.8100%	0.3300%	0.3658%	0.3775%	0.3717%	0.3867%	-0.7900%	-0.8317%	0.4233%	10.12%	3.96%	4.46%	6.16%	5.66%
Apr-62	-6.0700%	-3.5300%	0.3300%	0.3608%	0.3742%	0.3675%	0.3825%	-6.4000%	-6.4375%	-3.9125%	2.91%	3.96%	4.41%	-1.05%	-1.50%
May-62	-8.1100%	-9.1200%	0.3200%	0.3567%	0.3692%	0.3629%	0.3758%	-8.4300%	-8.4729%	-9.4958%	-7.65%	3.84%	4.36%	-11.49%	-12.00%
Jun-62	-8.0300%	-5.4800%	0.3000%	0.3567%	0.3700%	0.3633%	0.3733%	-8.3300%	-8.3933%	-5.8533%	-12.66%	3.60%	4.36%	-16.26%	-17.02%
Jul-62	6.5200%	6.8900%	0.3400%	0.3617%	0.3742%	0.3679%	0.3750%	6.1800%	6.1521%	6.5150%	-10.04%	4.08%	4.42%	-14.12%	-14.46%
Aug-62	2.0800%	2.7100%	0.3400%	0.3625%	0.3742%	0.3683%	0.3775%	1.7400%	1.7117%	2.3325%	-10.35%	4.08%	4.42%	-14.43%	-14.77%
Sep-62	-4.6500%	-3.3400%	0.3000%	0.3600%	0.3717%	0.3658%	0.3758%	-4.9500%	-5.0158%	-3.7158%	-12.92%	3.60%	4.39%	-16.52%	-17.31%
Oct-62	0.6400%	-0.1400%	0.3500%	0.3567%	0.3675%	0.3621%	0.3742%	0.2900%	0.2779%	-0.5142%	-14.90%	4.20%	4.35%	-19.10%	-19.24%
Nov-62	10.8600%	7.6800%	0.3100%	0.3542%	0.3667%	0.3604%	0.3708%	10.5500%	10.4996%	7.3092%	-9.69%	3.72%	4.33%	-13.41%	-14.01%
Dec-62	1.5300%	3.1200%	0.3200%	0.3533%	0.3650%	0.3592%	0.3700%	1.2100%	1.1708%	2.7500%	-8.73%	3.84%	4.31%	-12.57%	-13.04%
Jan-63	5.0600%	5.5800%	0.3200%	0.3508%	0.3642%	0.3575%	0.3658%	4.7400%	4.7025%	5.2142%	-0.47%	3.84%	4.29%	-4.31%	-4.76%
Feb-63	-2.3900%	-2.0600%	0.2900%	0.3492%	0.3633%	0.3563%	0.3642%	-2.6800%	-2.7463%	-2.4242%	-4.83%	3.48%	4.28%	-8.31%	-9.11%
Mar-63	3.7000%	1.8600%	0.3100%	0.3492%	0.3617%	0.3554%	0.3642%	3.3900%	3.3446%	1.4958%	-0.86%	3.72%	4.27%	-4.58%	-5.12%
Apr-63	5.0000%	2.3200%	0.3400%	0.3508%	0.3625%	0.3567%	0.3642%	4.6600%	4.6433%	1.9558%	10.83%	4.08%	4.28%	6.75%	6.55%
May-63	1.9300%	0.7000%	0.3300%	0.3517%	0.3633%	0.3575%	0.3642%	1.6000%	1.5725%	0.3358%	22.94%	3.96%	4.29%	18.98%	18.65%
Jun-63	-1.8800%	-1.2300%	0.3000%	0.3525%	0.3633%	0.3579%	0.3642%	-2.1800%	-2.2379%	-1.5942%	31.16%	3.60%	4.30%	27.56%	26.86%
Jul-63	-0.2200%	1.2300%	0.3600%	0.3550%	0.3658%	0.3604%	0.3658%	-0.5800%	-0.5804%	0.8642%	22.86%	4.32%	4.33%	18.54%	18.53%
Aug-63	5.3500%	4.2500%	0.3300%	0.3575%	0.3667%	0.3621%	0.3650%	5.0200%	4.9879%	3.8850%	26.79%	3.96%	4.35%	22.83%	22.45%
Sep-63	-0.9700%	-2.5800%	0.3400%	0.3592%	0.3675%	0.3633%	0.3667%	-1.3100%	-1.3333%	-2.9467%	31.69%	4.08%	4.36%	27.61%	27.33%
Oct-63	3.3900%	-0.3300%	0.3400%	0.3600%	0.3692%	0.3646%	0.3675%	3.0500%	3.0254%	-0.6975%	35.29%	4.08%	4.38%	31.21%	30.91%
Nov-63	-0.4600%	-0.8200%	0.3200%	0.3608%	0.3700%	0.3654%	0.3683%	-0.7800%	-0.8254%	-1.1883%	21.47%	3.84%	4.39%	17.63%	17.09%
Dec-63	2.6200%	3.1700%	0.3600%	0.3625%	0.3717%	0.3671%	0.3717%	2.2600%	2.2529%	2.7983%	22.78%	4.32%	4.41%	18.46%	18.37%
Jan-64	2.8300%	1.2700%	0.3500%	0.3642%	0.3742%	0.3692%	0.3742%	2.4800%	2.4608%	0.8958%	20.17%	4.20%	4.43%	15.97%	15.74%
Feb-64	1.4700%	0.3200%	0.3200%	0.3633%	0.3717%	0.3675%	0.3750%	1.1500%	1.1025%	-0.0550%	24.92%	3.84%	4.41%	21.08%	20.51%
Mar-64	1.6500%	-0.3500%	0.3700%	0.3650%	0.3725%	0.3688%	0.3758%	1.2800%	1.2813%	-0.7258%	22.45%	4.44%	4.43%	18.01%	18.03%
Apr-64	0.7500%	0.6700%	0.3500%	0.3667%	0.3742%	0.3704%	0.3767%	0.4000%	0.3796%	0.2933%	17.50%	4.20%	4.45%	13.30%	13.05%
May-64	1.6200%	0.3200%	0.3200%	0.3675%	0.3750%	0.3713%	0.3775%	1.3000%	1.2488%	-0.0575%	17.14%	3.84%	4.46%	13.30%	12.68%
Jun-64	1.7800%	2.3400%	0.3800%	0.3675%	0.3758%	0.3717%	0.3792%	1.4000%	1.4083%	1.9608%	21.51%	4.56%	4.46%	16.95%	17.05%
Jul-64	1.9500%	4.7100%	0.3500%	0.3667%	0.3750%	0.3708%	0.3783%	1.6000%	1.5792%	4.3317%	24.15%	4.20%	4.45%	19.95%	19.70%
Aug-64	-1.1800%	0.3100%	0.3500%	0.3675%	0.3742%	0.3708%	0.3783%	-1.5300%	-1.5508%	-0.0683%	16.46%	4.20%	4.45%	12.26%	12.01%
Sep-64	3.0100%	1.7000%	0.3400%	0.3683%	0.3733%	0.3708%	0.3775%	2.6700%	2.6392%	1.3225%	21.14%	4.08%	4.45%	17.06%	16.69%
Oct-64	0.9600%	1.6500%	0.3400%	0.3683%	0.3742%	0.3713%	0.3758%	0.6200%	0.5888%	1.2742%	18.29%	4.08%	4.46%	14.21%	13.83%
Nov-64	0.0500%	1.1400%	0.3500%	0.3692%	0.3742%	0.3717%	0.3775%	-0.3000%	-0.3217%	0.7625%	18.89%	4.20%	4.46%	14.69%	14.43%
Dec-64	0.5600%	0.8600%	0.3500%	0.3700%	0.3750%	0.3725%	0.3783%	0.2100%	0.1875%	0.4817%	16.51%	4.20%	4.47%	12.31%	12.04%
Jan-65	3.4500%	3.7100%	0.3300%	0.3692%	0.3733%	0.3713%	0.3775%	3.1200%	3.0788%	3.3325%	17.21%	3.96%	4.46%	13.25%	12.76%
Feb-65	0.3100%	0.0900%	0.3200%	0.3675%	0.3717%	0.3696%	0.3758%	-0.0100%	-0.0596%	-0.2858%	15.87%	3.84%	4.44%	12.03%	11.44%
Mar-65	-1.3300%	0.0700%	0.3800%	0.3683%	0.3733%	0.3708%	0.3750%	-1.7100%	-1.7008%	-0.3050%	12.47%	4.56%	4.45%	7.91%	8.02%
Apr-65	3.5600%	1.0900%	0.3300%	0.3692%	0.3733%	0.3713%	0.3742%	3.2300%	3.1888%	0.7158%	15.61%	3.96%	4.46%	11.65%	11.16%
May-65	-0.3000%	-0.8400%	0.3300%	0.3700%	0.3742%	0.3721%	0.3750%	-0.6300%	-0.6721%	-1.2150%	13.43%	3.96%	4.47%	9.47%	8.96%
Jun-65	-4.7300%	-3.4000%	0.3800%	0.3717%	0.3767%	0.3742%	0.3767%	-5.1100%	-5.1042%	-3.7767%	6.17%	4.56%	4.49%	1.61%	1.68%
Jul-65	1.4700%	1.0500%	0.3400%	0.3733%	0.3800%	0.3767%	0.3783%	1.1300%	1.0933%	0.6717%	5.67%	4.08%	4.52%	1.59%	1.15%
Aug-65	2.7200%	0.9700%	0.3700%	0.3742%	0.3825%	0.3783%	0.3817%	2.3500%	2.3417%	0.5883%	9.84%	4.44%	4.54%	5.40%	5.30%
Sep-65	3.3400%	1.9400%	0.3500%	0.3767%	0.3858%	0.3813%	0.3858%	2.9900%	2.9588%	1.5542%	10.19%	4.20%	4.58%	5.99%	5.62%
Oct-65	2.8900%	1.2900%	0.3400%	0.3800%	0.3883%	0.3842%	0.3883%	2.5500%	2.5058%	0.9017%	12.30%	4.08%	4.61%	8.22%	7.69%
Nov-65	-0.3100%	-1.1600%	0.3700%	0.3833%	0.3908%	0.3871%	0.3925%	-0.6800%	-0.6971%	-1.5525%	11.90%	4.44%	4.65%	7.46%	7.25%
Dec-65	1.0600%	-0.0800%	0.3700%	0.3900%	0.4000%	0.3950%	0.4025%	0.6900%	0.6650%	-0.4825%	12.45%	4.44%	4.74%	8.01%	7.71%
Jan-66	0.6200%	-2.9700%	0.3800%	0.3950%	0.4025%	0.3988%	0.4050%	0.2400%	0.2213%	-3.3750%	9.38%	4.56%	4.79%	4.82%	4.59%
Feb-66	-1.3100%	-4.1400%	0.3400%	0.3983%	0.4083%	0.4033%	0.4100%	-1.6500%	-1.7133%	-4.5500%	7.61%	4.08%	4.84%	3.53%	2.77%
Mar-66	-2.0500%	-0.4500%	0.4000%	0.4100%	0.4208%	0.4154%	0.4283%	-2.4500%	-2.4654%	-0.8783%	6.82%	4.80%	4.99%	2.02%	1.84%

	Market Return	S&P Return	Ibbot LT RF	Aaa Corp	Aa Corp	Avg Aaa and Aa Corp	A PU	RPMKT	RPAAAAA	RPSPA	Mkt Annlized Return	RF Annualized Yield	AAAAA Annualized Yield	MRP RP	AAAAA RP
Apr-66	2.2000%	1.7200%	0.3600%	0.4108%	0.4250%	0.4179%	0.4375%	1.8400%	1.7821%	1.2825%	5.42%	4.32%	5.02%	1.10%	0.41%
May-66	-4.9200%	-2.9600%	0.4100%	0.4150%	0.4250%	0.4200%	0.4375%	-5.3300%	-5.3400%	-3.3975%	0.54%	4.92%	5.04%	-4.38%	-4.50%
Jun-66	-1.4600%	-1.8100%	0.3900%	0.4225%	0.4300%	0.4263%	0.4500%	-1.8500%	-1.8863%	-2.2600%	3.99%	4.68%	5.12%	-0.69%	-1.13%
Jul-66	-1.2000%	0.0900%	0.3800%	0.4300%	0.4375%	0.4338%	0.4542%	-1.5800%	-1.6338%	-0.3642%	1.25%	4.56%	5.21%	-3.31%	-3.95%
Aug-66	-7.2500%	-8.7500%	0.4300%	0.4425%	0.4483%	0.4454%	0.4650%	-7.6800%	-7.6954%	-9.2150%	-8.58%	5.16%	5.35%	-13.74%	-13.92%
Sep-66	-0.5300%	4.7500%	0.4100%	0.4575%	0.4650%	0.4613%	0.4842%	-0.9400%	-0.9913%	4.2658%	-12.00%	4.92%	5.54%	-16.92%	-17.54%
Oct-66	4.9400%	9.7000%	0.4000%	0.4508%	0.4583%	0.4546%	0.4783%	4.5400%	4.4854%	9.2217%	-10.25%	4.80%	5.46%	-15.05%	-15.70%
Nov-66	0.9500%	-0.7600%	0.3800%	0.4458%	0.4550%	0.4504%	0.4692%	0.5700%	0.4996%	-1.2292%	-9.11%	4.56%	5.41%	-13.67%	-14.52%
Dec-66	0.0200%	2.2100%	0.3900%	0.4492%	0.4567%	0.4529%	0.4725%	-0.3700%	-0.4329%	1.7375%	-10.05%	4.68%	5.44%	-14.73%	-15.48%
Jan-67	7.9800%	2.7100%	0.4000%	0.4333%	0.4417%	0.4375%	0.4550%	7.5800%	7.5425%	2.2550%	-3.47%	4.80%	5.25%	-8.27%	-8.72%
Feb-67	0.7200%	-1.5700%	0.3400%	0.4192%	0.4317%	0.4254%	0.4400%	0.3800%	0.2946%	-2.0100%	-1.48%	4.08%	5.11%	-5.56%	-6.59%
Mar-67	4.0900%	1.9700%	0.3900%	0.4275%	0.4358%	0.4317%	0.4533%	3.7000%	3.6583%	1.5167%	4.69%	4.68%	5.18%	0.01%	-0.49%
Apr-67	4.3700%	2.0200%	0.3500%	0.4258%	0.4383%	0.4321%	0.4517%	4.0200%	3.9379%	1.5683%	6.92%	4.20%	5.19%	2.72%	1.73%
May-67	-4.7700%	-5.0600%	0.4300%	0.4367%	0.4517%	0.4442%	0.4717%	-5.2000%	-5.2142%	-5.5317%	7.08%	5.16%	5.33%	1.92%	1.75%
Jun-67	1.9000%	-1.3100%	0.3900%	0.4533%	0.4692%	0.4613%	0.4867%	1.5100%	1.4388%	-1.7967%	10.74%	4.68%	5.54%	6.06%	5.20%
Jul-67	4.6800%	2.0400%	0.4300%	0.4650%	0.4767%	0.4708%	0.4950%	4.2500%	4.2092%	1.5450%	17.33%	5.16%	5.65%	12.17%	11.68%
Aug-67	-0.7000%	-0.6500%	0.4200%	0.4683%	0.4800%	0.4742%	0.4967%	-1.1200%	-1.1742%	-1.1467%	25.61%	5.04%	5.69%	20.57%	19.92%
Sep-67	3.4200%	-0.3700%	0.4000%	0.4708%	0.4892%	0.4800%	0.5042%	3.0200%	2.9400%	-0.8742%	30.60%	4.80%	5.76%	25.80%	24.84%
Oct-67	-2.7600%	-5.7200%	0.4500%	0.4850%	0.5008%	0.4929%	0.5150%	-3.2100%	-3.2529%	-6.2350%	21.02%	5.40%	5.92%	15.62%	15.10%
Nov-67	0.6500%	2.9300%	0.4500%	0.5058%	0.5192%	0.5125%	0.5400%	0.2000%	0.1375%	2.3900%	20.66%	5.40%	6.15%	15.26%	14.51%
Dec-67	2.7800%	2.8600%	0.4400%	0.5158%	0.5292%	0.5225%	0.5558%	2.3400%	2.2575%	2.3042%	23.99%	5.28%	6.27%	18.71%	17.72%
Jan-68	-4.2500%	0.8200%	0.5000%	0.5142%	0.5242%	0.5192%	0.5450%	-4.7500%	-4.7692%	0.2750%	9.94%	6.00%	6.23%	3.94%	3.71%
Feb-68	-2.6100%	-2.3300%	0.4200%	0.5083%	0.5225%	0.5154%	0.5308%	-3.0300%	-3.1254%	-2.8608%	6.31%	5.04%	6.19%	1.27%	0.12%
Mar-68	1.1000%	-3.9900%	0.4300%	0.5092%	0.5233%	0.5163%	0.5342%	0.6700%	0.5838%	-4.5242%	3.26%	5.16%	6.20%	-1.90%	-2.94%
Apr-68	8.3400%	2.7500%	0.4900%	0.5175%	0.5317%	0.5246%	0.5483%	7.8500%	7.8154%	2.2017%	7.18%	5.88%	6.30%	1.30%	0.89%
May-68	1.6100%	-0.6200%	0.4600%	0.5225%	0.5400%	0.5313%	0.5517%	1.1500%	1.0788%	-1.1717%	14.36%	5.52%	6.38%	8.84%	7.99%
Jun-68	1.0500%	8.0700%	0.4200%	0.5233%	0.5417%	0.5325%	0.5517%	0.6300%	0.5175%	7.5183%	13.41%	5.04%	6.39%	8.37%	7.02%
Jul-68	-1.7200%	-0.7000%	0.4800%	0.5200%	0.5375%	0.5288%	0.5442%	-2.2000%	-2.2488%	-1.2442%	6.48%	5.76%	6.35%	0.72%	0.13%
Aug-68	1.6400%	0.0400%	0.4200%	0.5017%	0.5208%	0.5113%	0.5225%	1.2200%	1.1288%	-0.4825%	8.99%	5.04%	6.14%	3.95%	2.85%
Sep-68	4.0000%	1.0000%	0.4400%	0.4975%	0.5192%	0.5083%	0.5225%	3.5600%	3.4917%	0.4775%	9.60%	5.28%	6.10%	4.32%	3.50%
Oct-68	0.8700%	0.8600%	0.4500%	0.5075%	0.5267%	0.5171%	0.5333%	0.4200%	0.3529%	0.3267%	13.69%	5.40%	6.21%	8.29%	7.48%
Nov-68	5.3100%	7.8100%	0.4300%	0.5158%	0.5375%	0.5267%	0.5492%	4.8800%	4.7833%	7.2608%	18.95%	5.16%	6.32%	13.79%	12.63%
Dec-68	-4.0200%	-3.0900%	0.4900%	0.5375%	0.5550%	0.5463%	0.5725%	-4.5100%	-4.5663%	-3.6625%	11.08%	5.88%	6.56%	5.20%	4.53%
Jan-69	-0.6800%	1.6900%	0.5000%	0.5492%	0.5608%	0.5550%	0.5867%	-1.1800%	-1.2350%	1.1033%	15.22%	6.00%	6.66%	9.22%	8.56%
Feb-69	-4.2600%	-5.3200%	0.4600%	0.5550%	0.5642%	0.5596%	0.5942%	-4.7200%	-4.8196%	-5.9142%	13.27%	5.52%	6.72%	7.75%	6.56%
Mar-69	3.5900%	-0.9600%	0.4700%	0.5708%	0.5792%	0.5750%	0.6058%	3.1200%	3.0150%	-1.5658%	16.06%	5.64%	6.90%	10.42%	9.16%
Apr-69	2.2900%	1.3900%	0.5500%	0.5742%	0.5850%	0.5796%	0.6083%	1.7400%	1.7104%	0.7817%	9.58%	6.60%	6.96%	2.98%	2.62%
May-69	0.2600%	-0.0600%	0.4700%	0.5658%	0.5800%	0.5729%	0.5967%	-0.2100%	-0.3129%	-0.6567%	8.12%	5.64%	6.88%	2.48%	1.25%
Jun-69	-5.4200%	-5.1600%	0.5500%	0.5817%	0.5933%	0.5875%	0.6175%	-5.9700%	-6.0075%	-5.7775%	1.20%	6.60%	7.05%	-5.40%	-5.85%
Jul-69	-5.8700%	-3.6300%	0.5200%	0.5900%	0.6033%	0.5967%	0.6267%	-6.3900%	-6.4667%	-4.2567%	-3.07%	6.24%	7.16%	-9.31%	-10.23%
Aug-69	4.5400%	-1.1400%	0.4800%	0.5808%	0.6025%	0.5917%	0.6200%	4.0600%	3.9483%	-1.7600%	-0.31%	5.76%	7.10%	-6.07%	-7.41%
Sep-69	-2.3600%	-3.7200%	0.5500%	0.5950%	0.6133%	0.6042%	0.6358%	-2.9100%	-2.9642%	-4.3558%	-6.40%	6.60%	7.25%	-13.00%	-13.65%
Oct-69	4.5900%	7.9800%	0.5700%	0.6108%	0.6275%	0.6192%	0.6683%	4.0200%	3.9708%	7.3117%	-2.95%	6.84%	7.43%	-9.79%	-10.38%
Nov-69	-2.9700%	-5.8800%	0.4900%	0.6125%	0.6317%	0.6221%	0.6667%	-3.4600%	-3.5921%	-6.5467%	-10.58%	5.88%	7.47%	-16.46%	-18.05%
Dec-69	-1.7700%	-0.9700%	0.6000%	0.6433%	0.6608%	0.6521%	0.7158%	-2.3700%	-2.4221%	-1.6858%	-8.49%	7.20%	7.83%	-15.69%	-16.31%
Jan-70	-7.4300%	-4.5300%	0.5600%	0.6592%	0.6792%	0.6692%	0.7242%	-7.9900%	-8.0992%	-5.2542%	-14.71%	6.72%	8.03%	-21.43%	-22.74%
Feb-70	5.5800%	10.5300%	0.5200%	0.6608%	0.6775%	0.6692%	0.7092%	5.0600%	4.9108%	9.8208%	-5.94%	6.24%	8.03%	-12.18%	-13.97%
Mar-70	0.4400%	2.3200%	0.5600%	0.6533%	0.6717%	0.6625%	0.6925%	-0.1200%	-0.2225%	1.6275%	-8.80%	6.72%	7.95%	-15.52%	-16.75%
Apr-70	-8.7500%	-9.2900%	0.5400%	0.6525%	0.6692%	0.6608%	0.6925%	-9.2900%	-9.4108%	-9.9825%	-18.64%	6.48%	7.93%	-25.12%	-26.57%
May-70	-5.7800%	-5.1500%	0.5500%	0.6758%	0.6867%	0.6813%	0.7225%	-6.3300%	-6.4613%	-5.8725%	-23.54%	6.60%	8.18%	-30.14%	-31.72%
Jun-70	-4.6600%	-5.8200%	0.6400%	0.7067%	0.7150%	0.7108%	0.7533%	-5.3000%	-5.3708%	-6.5733%	-22.93%	7.68%	8.53%	-30.61%	-31.46%
Jul-70	7.6900%	9.7300%	0.5900%	0.7033%	0.7200%	0.7117%	0.7550%	7.1000%	6.9783%	8.9750%	-11.83%	7.08%	8.54%	-18.91%	-20.37%
Aug-70	4.7800%	5.8100%	0.5700%	0.6775%	0.7075%	0.6925%	0.7400%	4.2100%	4.0875%	5.0700%	-11.62%	6.84%	8.31%	-18.46%	-19.93%
Sep-70	3.6200%	-1.1400%	0.5600%	0.6742%	0.7058%	0.6900%	0.7350%	3.0600%	2.9300%	-1.8750%	-6.21%	6.72%	8.28%	-12.93%	-14.49%
Oct-70	-0.8300%	-1.4900%	0.5500%	0.6692%	0.7033%	0.6863%	0.7300%	-1.3800%	-1.5163%	-2.2200%	-11.07%	6.60%	8.24%	-17.67%	-19.31%
Nov-70	5.0600%	9.7500%	0.5800%	0.6708%	0.7017%	0.6863%	0.7325%	4.4800%	4.3738%	9.0175%	-3.71%	6.96%	8.24%	-10.67%	-11.95%
Dec-70	5.9700%	7.3500%	0.5300%	0.6367%	0.6775%	0.6571%	0.7067%	5.4400%	5.3129%	6.6433%	3.87%	6.36%	7.89%	-2.49%	-4.01%
Jan-71	4.3200%	2.5700%	0.5100%	0.6133%	0.6583%	0.6358%	0.6792%	3.8100%	3.6842%	1.8908%	17.06%	6.12%	7.63%	10.94%	9.43%
Feb-71	1.1700%	-2.7700%	0.4600%	0.5900%	0.6392%	0.6146%	0.6575%	0.7100%	0.5554%	-3.4275%	12.17%	5.52%	7.38%	6.65%	4.79%
Mar-71	3.9400%	3.3100%	0.5600%	0.6008%	0.6442%	0.6225%	0.6708%	3.3800%	3.3175%	2.6392%	16.08%	6.72%	7.47%	9.36%	8.61%
Apr-71	3.8900%	-3.4900%	0.4800%	0.6042%	0.6450%	0.6246%	0.6725%	3.4100%	3.2654%	-4.1625%	32.16%	5.76%	7.50%	26.40%	24.66%
May-71	-3.9100%	-3.5100%	0.4700%	0.6275%	0.6533%	0.6404%	0.6950%	-4.3800%	-4.5504%	-4.2050%	34.78%	5.64%	7.69%	29.14%	27.10%
Jun-71	0.3300%	3.9800%	0.5600%	0.6367%	0.6633%	0.6500%	0.7042%	-0.2300%	-0.3200%	3.2758%	41.83%	6.72%	7.80%	35.11%	34.03%
Jul-71	-3.8700%	-2.2500%	0.5200%	0.6367%	0.6633%	0.6500%	0.7042%	-4.3900%	-4.5200%	-2.9542%	26.61%	6.24%	7.80%	20.37%	18.81%
Aug-71	3.8800%	-2.4700%	0.5500%	0.6325%	0.6608%	0.6467%	0.7000%	3.3300%	3.2333%	-3.1700%	25.52%	6.60%	7.76%	18.92%	17.76%
Sep-71	-0.4400%	-1.4600%	0.5000%	0.6200%	0.6508%	0.6354%	0.6817%	-0.9400%	-1.0754%	-2.1417%	20.60%	6.00%	7.63%	14.60%	12.98%
Oct-71	-3.9200%	1.7000%	0.4700%	0.6158%	0.6408%	0.6283%	0.6750%	-4.3900%	-4.5483%	1.0250%	16.85%	5.64%	7.54%	11.21%	9.31%
Nov-71	0.0200%	-0.5500%	0.5100%	0.6050%	0.6300%	0.6175%	0.6633%	-0.4900%	-0.5975%	-1.2133%	11.24%	6.12%	7.41%	5.12%	3.83%
Dec-71	8.8800%	8.0600%	0.5000%	0.6042%	0.6308%	0.6175%	0.6583%	8.3800%	8.2625%	7.4017%	14.30%	6.00%	7.41%	8.30%	6.89%
Jan-72	2.0600%	-0.7400%	0.5000%	0.5992%	0.6267%	0.6129%	0.6492%	1.5600%	1.4471%	-1.3892%	11.82%	6.00%	7.36%	5.82%	4.46%
Feb-72	2.7700%	-2.4000%	0.4700%	0.6058%	0.6267%	0.6163%	0.6483%	2.3000%	2.1538%	-3.0483%	13.59%	5.64%	7.40%	7.95%	6.19%
Mar-72	0.8300%	-0.3600%	0.4900%	0.6033%	0.6275%	0.6154%	0.6475%	0.3400%	0.2146%	-1.0075%	10.19%	5.88%	7.39%	4.31%	2.80%
Apr-72	0.6800%	-2.7700%	0.4800%	0.6083%	0.6308%	0.6196%	0.6517%	0.2000%	0.0604%	-3.4217%	6.78%	5.76%	7.44%	1.02%	-0.65%
May-72	1.9700%	-0.1700%	0.5500%	0.6083%	0.6300%	0.6192%	0.6533%	1.4200%	1.3508%	-0.8233%	13.32%	6.60%	7.43%	6.72%	5.89%
Jun-72	-1.9400%	-2.1000%	0.4900%	0.6025%	0.6258%	0.6142%	0.6475%	-2.4300%	-2.5542%	-2.7475%	10.75%	5.88%	7.37%	4.87%	3.38%
Jul-72	0.4800%	-0.1400%	0.5100%	0.6008%	0.6250%	0.6129%	0.6517%	-0.0300%	-0.1329%	-0.7917%	15.77%	6.12%	7.36%	9.65%	8.41%
Aug-72	3.6900%	5.7400%	0.4900%	0.5992%	0.6192%	0.6092%	0.6367%	3.2000%	3.0808%	5.1033%	15.55%	5.88%	7.31%	9.67%	8.24%
Sep-72	-0.2500%	0.2700%	0.4700%	0.6017%	0.6175%	0.6096%	0.6342%	-0.7200%	-0.8596%	-0.3642%	15.78%	5.64%	7.32%	10.14%	8.46%
Oct-72	1.1800%	6.5100%	0.5200%	0.6008%	0.6208%	0.6108%	0.6383%	0.6600%	0.5692%	5.8717%	21.92%	6.24%	7.33%	15.68%	14.59%
Nov-72	4.8100%	6.3900%	0.4800%	0.5933%	0.6158%	0.6046%	0.6333%	4.3300%	4.2054%	5.7567%	27.76%	5.76%	7.26%	22.00%	20.50%
Dec-72	1.4200%	-1.7400%	0.4500%	0.5900%	0.6133%	0.6017%	0.6233%	0.9700%	0.8183%	-2.3633%	19.01%	5.40%	7.22%	13.61%	11.79%

	Market Return	S&P Return	Ibbot LT RF	Aaa Corp	Aa Corp	Avg Aaa and Aa Corp	A PU	RPMKT	RPAAAAA	RPSPA	Mkt Annlized Return	RF Annualized Yield	AAAAA Annualized Yield	MRP RP	AAAAA RP
Jan-73	-1.4900%	-4.3900%	0.5400%	0.5958%	0.6142%	0.6050%	0.6267%	-2.0300%	-2.0950%	-5.0167%	14.87%	6.48%	7.26%	8.39%	7.61%
Feb-73	-3.5200%	-2.3400%	0.5100%	0.6017%	0.6225%	0.6121%	0.6350%	-4.0300%	-4.1321%	-2.9750%	7.84%	6.12%	7.35%	1.72%	0.49%
Mar-73	0.0800%	-1.3500%	0.5600%	0.6075%	0.6242%	0.6158%	0.6383%	-0.4800%	-0.5358%	-1.9883%	7.03%	6.72%	7.39%	0.31%	-0.36%
Apr-73	-3.8300%	-0.4900%	0.5700%	0.6050%	0.6242%	0.6146%	0.6358%	-4.4000%	-4.4446%	-1.1258%	2.24%	6.84%	7.38%	-4.60%	-5.14%
May-73	-1.6300%	0.6700%	0.5800%	0.6075%	0.6242%	0.6158%	0.6358%	-2.2100%	-2.2458%	0.0342%	-1.37%	6.96%	7.39%	-8.33%	-8.76%
Jun-73	-0.4000%	-1.6700%	0.5500%	0.6142%	0.6292%	0.6217%	0.6425%	-0.9500%	-1.0217%	-2.3125%	0.18%	6.60%	7.46%	-6.42%	-7.28%
Jul-73	4.0700%	-1.9900%	0.6100%	0.6208%	0.6367%	0.6288%	0.6517%	3.4600%	3.4413%	-2.6417%	3.76%	7.32%	7.55%	-3.56%	-3.79%
Aug-73	-3.4100%	-2.8400%	0.6200%	0.6400%	0.6533%	0.6467%	0.6700%	-4.0300%	-4.0567%	-3.5100%	-3.35%	7.44%	7.76%	-10.79%	-11.11%
Sep-73	4.2700%	7.7100%	0.5500%	0.6358%	0.6550%	0.6454%	0.6700%	3.7200%	3.6246%	7.0400%	1.03%	6.60%	7.75%	-5.57%	-6.71%
Oct-73	0.1700%	-3.8800%	0.6300%	0.6333%	0.6533%	0.6433%	0.6683%	-0.4600%	-0.4733%	-4.5483%	0.02%	7.56%	7.72%	-7.54%	-7.70%
Nov-73	-11.0900%	-11.7200%	0.5600%	0.6392%	0.6583%	0.6488%	0.6792%	-11.6500%	-11.7388%	-12.3992%	-15.15%	6.72%	7.79%	-21.87%	-22.93%
Dec-73	1.9800%	3.7500%	0.6000%	0.6400%	0.6600%	0.6500%	0.6867%	1.3800%	1.3300%	3.0633%	-14.68%	7.20%	7.80%	-21.88%	-22.48%
Jan-74	-0.7200%	4.1800%	0.6100%	0.6525%	0.6667%	0.6596%	0.6967%	-1.3300%	-1.3796%	3.4833%	-14.01%	7.32%	7.92%	-21.33%	-21.93%
Feb-74	-0.0700%	0.6000%	0.5500%	0.6542%	0.6708%	0.6625%	0.7017%	-0.6200%	-0.7325%	-0.1017%	-10.94%	6.60%	7.95%	-17.54%	-18.89%
Mar-74	-2.0500%	-3.8900%	0.5900%	0.6675%	0.6817%	0.6746%	0.7050%	-2.6400%	-2.7246%	-4.5950%	-12.83%	7.08%	8.10%	-19.91%	-20.93%
Apr-74	-3.5900%	-12.9600%	0.6800%	0.6875%	0.7025%	0.6950%	0.7308%	-4.2700%	-4.2850%	-13.6908%	-12.62%	8.16%	8.34%	-20.78%	-20.96%
May-74	-3.0200%	-4.8400%	0.6800%	0.6975%	0.7150%	0.7063%	0.7500%	-3.7000%	-3.7263%	-5.5900%	-13.85%	8.16%	8.48%	-22.01%	-22.33%
Jun-74	-1.1300%	-5.7000%	0.6100%	0.7058%	0.7292%	0.7175%	0.7767%	-1.7400%	-1.8475%	-6.4767%	-14.48%	7.32%	8.61%	-21.80%	-23.09%
Jul-74	-7.4200%	-0.8900%	0.7200%	0.7267%	0.7508%	0.7388%	0.8050%	-8.1400%	-8.1588%	-1.6950%	-23.92%	8.64%	8.87%	-32.56%	-32.79%
Aug-74	-8.6400%	-8.7100%	0.6500%	0.7500%	0.7733%	0.7617%	0.8358%	-9.2900%	-9.4017%	-9.5458%	-28.04%	7.80%	9.14%	-35.84%	-37.18%
Sep-74	-11.5200%	-0.8600%	0.7100%	0.7700%	0.8050%	0.7875%	0.8708%	-12.2300%	-12.3075%	-1.7308%	-38.94%	8.52%	9.45%	-47.46%	-48.39%
Oct-74	16.8100%	11.9900%	0.7000%	0.7725%	0.8033%	0.7879%	0.8983%	16.1100%	16.0221%	11.0917%	-28.80%	8.40%	9.46%	-37.20%	-38.25%
Nov-74	-4.8900%	-1.1900%	0.6200%	0.7408%	0.7783%	0.7596%	0.8717%	-5.5100%	-5.6496%	-2.0617%	-23.83%	7.44%	9.12%	-31.27%	-32.95%
Dec-74	-1.5600%	0.4400%	0.6700%	0.7408%	0.7667%	0.7538%	0.8558%	-2.2300%	-2.3138%	-0.4158%	-26.48%	8.04%	9.05%	-34.52%	-35.52%
Jan-75	12.7200%	18.9700%	0.6800%	0.7358%	0.7608%	0.7483%	0.8642%	12.0400%	11.9717%	18.1058%	-16.52%	8.16%	8.98%	-24.68%	-25.50%
Feb-75	6.3800%	1.4300%	0.6000%	0.7183%	0.7425%	0.7304%	0.8325%	5.7800%	5.6496%	0.5975%	-11.14%	7.20%	8.77%	-18.34%	-19.90%
Mar-75	2.5400%	-2.1600%	0.6600%	0.7225%	0.7433%	0.7329%	0.8100%	1.8800%	1.8071%	-2.9700%	-6.97%	7.92%	8.80%	-14.89%	-15.77%
Apr-75	5.1000%	-1.4000%	0.6700%	0.7458%	0.7658%	0.7558%	0.8383%	4.4300%	4.3442%	-2.2383%	1.41%	8.04%	9.07%	-6.63%	-7.66%
May-75	4.7600%	8.6600%	0.6700%	0.7417%	0.7700%	0.7558%	0.8525%	4.0900%	4.0042%	7.8075%	9.55%	8.04%	9.07%	1.51%	0.48%
Jun-75	4.7700%	10.6700%	0.7000%	0.7308%	0.7608%	0.7458%	0.8417%	4.0700%	4.0242%	9.8283%	16.09%	8.40%	8.95%	7.69%	7.14%
Jul-75	-6.4400%	-5.1000%	0.6800%	0.7367%	0.7608%	0.7488%	0.8342%	-7.1200%	-7.1888%	-5.9342%	17.32%	8.16%	8.99%	9.16%	8.33%
Aug-75	-1.7600%	-2.1200%	0.6500%	0.7458%	0.7692%	0.7575%	0.8433%	-2.4100%	-2.5175%	-2.9633%	26.15%	7.80%	9.09%	18.35%	17.06%
Sep-75	-3.1200%	-0.4900%	0.7300%	0.7458%	0.7792%	0.7625%	0.8492%	-3.8500%	-3.8825%	-1.3392%	38.13%	8.76%	9.15%	29.37%	28.98%
Oct-75	6.5300%	7.0800%	0.7200%	0.7383%	0.7767%	0.7575%	0.8467%	5.8100%	5.7725%	6.2333%	25.97%	8.64%	9.09%	17.33%	16.88%
Nov-75	2.8200%	3.5000%	0.6100%	0.7317%	0.7692%	0.7504%	0.8367%	2.2100%	2.0696%	2.6633%	36.18%	7.32%	9.01%	28.86%	27.18%
Dec-75	-0.8100%	0.7700%	0.7500%	0.7325%	0.7713%	0.7519%	0.8425%	-1.5600%	-1.5619%	-0.0725%	37.22%	9.00%	9.02%	28.22%	28.20%
Jan-76	12.1700%	8.9400%	0.6500%	0.7167%	0.7608%	0.7388%	0.8250%	11.5200%	11.4313%	8.1150%	36.55%	7.80%	8.87%	28.75%	27.69%
Feb-76	-0.8400%	-3.5600%	0.6100%	0.7125%	0.7517%	0.7321%	0.8092%	-1.4500%	-1.5721%	-4.3692%	27.28%	7.32%	8.79%	19.96%	18.50%
Mar-76	3.3700%	1.0000%	0.7100%	0.7100%	0.7508%	0.7304%	0.8058%	2.6600%	2.6396%	0.1942%	28.31%	8.52%	8.77%	19.79%	19.55%
Apr-76	-0.7800%	0.3700%	0.6400%	0.7000%	0.7408%	0.7204%	0.7942%	-1.4200%	-1.5004%	-0.4242%	21.13%	7.68%	8.65%	13.45%	12.49%
May-76	-1.1100%	-1.3900%	0.5900%	0.7150%	0.7433%	0.7292%	0.7958%	-1.7000%	-1.8392%	-2.1858%	14.35%	7.08%	8.75%	7.27%	5.60%
Jun-76	4.4300%	3.3700%	0.7300%	0.7183%	0.7408%	0.7296%	0.7950%	3.7000%	3.7004%	2.5750%	13.98%	8.76%	8.76%	5.22%	5.22%
Jul-76	-0.4800%	3.4100%	0.6500%	0.7133%	0.7342%	0.7238%	0.7808%	-1.1300%	-1.2038%	2.6292%	21.24%	7.80%	8.69%	13.44%	12.55%
Aug-76	-0.1800%	3.8300%	0.6900%	0.7042%	0.7217%	0.7129%	0.7608%	-0.8700%	-0.8929%	3.0692%	23.19%	8.28%	8.56%	14.91%	14.63%
Sep-76	2.5800%	3.8100%	0.6400%	0.6983%	0.7117%	0.7050%	0.7417%	1.9400%	1.8750%	3.0683%	30.43%	7.68%	8.46%	22.75%	21.97%
Oct-76	-1.8600%	-0.2100%	0.6100%	0.6933%	0.7067%	0.7000%	0.7325%	-2.4700%	-2.5600%	-0.9425%	20.16%	7.32%	8.40%	12.84%	11.76%
Nov-76	-0.4100%	2.6800%	0.6600%	0.6875%	0.7050%	0.6963%	0.7300%	-1.0700%	-1.1063%	1.9500%	16.39%	7.92%	8.36%	8.47%	8.03%
Dec-76	5.6100%	6.3100%	0.6300%	0.6650%	0.6871%	0.6760%	0.7183%	4.9800%	4.9340%	5.5917%	23.92%	7.56%	8.11%	16.36%	15.81%
Jan-77	-4.7300%	0.3500%	0.5900%	0.6633%	0.6800%	0.6717%	0.7175%	-5.3200%	-5.4017%	-0.3675%	5.25%	7.08%	8.06%	-1.83%	-2.81%
Feb-77	-1.8200%	-3.7200%	0.5700%	0.6700%	0.6883%	0.6792%	0.7208%	-2.3900%	-2.4992%	-4.4408%	4.21%	6.84%	8.15%	-2.63%	-3.94%
Mar-77	-1.0500%	1.0200%	0.6500%	0.6750%	0.6900%	0.6825%	0.7250%	-1.7000%	-1.7325%	0.2950%	-0.25%	7.80%	8.19%	-8.05%	-8.44%
Apr-77	0.4200%	2.0900%	0.6100%	0.6700%	0.6900%	0.6800%	0.7258%	-0.1900%	-0.2600%	1.3642%	0.96%	7.32%	8.16%	-6.36%	-7.20%
May-77	-1.9600%	2.1100%	0.6700%	0.6708%	0.6900%	0.6804%	0.7258%	-2.6300%	-2.6404%	1.3842%	0.09%	8.04%	8.17%	-7.95%	-8.07%
Jun-77	4.9400%	5.3100%	0.6200%	0.6625%	0.6825%	0.6725%	0.7150%	4.3200%	4.2675%	4.5950%	0.58%	7.44%	8.07%	-6.86%	-7.49%
Jul-77	-1.2400%	1.6400%	0.5900%	0.6617%	0.6767%	0.6692%	0.7092%	-1.8300%	-1.9092%	0.9308%	-0.19%	7.08%	8.03%	-7.27%	-8.22%
Aug-77	-1.7200%	-3.5300%	0.6700%	0.6650%	0.6808%	0.6729%	0.7075%	-2.3900%	-2.3929%	-4.2375%	-1.73%	8.04%	8.08%	-9.77%	-9.80%
Sep-77	0.1600%	2.4700%	0.6100%	0.6600%	0.6792%	0.6696%	0.7050%	-0.4500%	-0.5096%	1.7650%	-4.05%	7.32%	8.04%	-11.37%	-12.08%
Oct-77	-3.9000%	-2.9600%	0.6300%	0.6700%	0.6883%	0.6792%	0.7175%	-4.5300%	-4.5792%	-3.6775%	-6.04%	7.56%	8.15%	-13.60%	-14.19%
Nov-77	3.1600%	3.8100%	0.6300%	0.6733%	0.6950%	0.6842%	0.7200%	2.5300%	2.4758%	3.0900%	-2.67%	7.56%	8.21%	-10.23%	-10.88%
Dec-77	0.7500%	0.1900%	0.6200%	0.6825%	0.7004%	0.6915%	0.7200%	0.1300%	0.0585%	-0.5300%	-7.15%	7.44%	8.30%	-14.59%	-15.45%
Jan-78	-5.7400%	-5.3300%	0.6900%	0.7008%	0.7158%	0.7083%	0.7433%	-6.4300%	-6.4483%	-6.0733%	-8.13%	8.28%	8.50%	-16.41%	-16.63%
Feb-78	-2.0300%	-0.6200%	0.6000%	0.7058%	0.7208%	0.7133%	0.7475%	-2.6300%	-2.7433%	-1.3675%	-8.33%	7.20%	8.56%	-15.53%	-16.89%
Mar-78	2.9400%	3.0900%	0.6900%	0.7058%	0.7217%	0.7138%	0.7483%	2.2500%	2.2263%	2.3417%	-4.63%	8.28%	8.57%	-12.91%	-13.20%
Apr-78	9.0200%	1.0600%	0.6300%	0.7133%	0.7275%	0.7204%	0.7575%	8.3900%	8.2996%	0.3025%	3.53%	7.56%	8.65%	-4.03%	-5.11%
May-78	0.9200%	0.4300%	0.7500%	0.7242%	0.7367%	0.7304%	0.7683%	0.1700%	0.1896%	-0.3383%	6.57%	9.00%	8.77%	-2.43%	-2.19%
Jun-78	-1.3800%	0.3600%	0.6900%	0.7300%	0.7458%	0.7379%	0.7833%	-2.0700%	-2.1179%	-0.4233%	0.16%	8.28%	8.86%	-8.12%	-8.70%
Jul-78	5.8300%	3.1600%	0.7300%	0.7400%	0.7558%	0.7479%	0.7925%	5.1000%	5.0821%	2.3675%	7.33%	8.76%	8.98%	-1.43%	-1.65%
Aug-78	3.0100%	-0.0300%	0.7000%	0.7242%	0.7467%	0.7354%	0.7767%	2.3100%	2.2746%	-0.8067%	12.49%	8.40%	8.83%	4.09%	3.67%
Sep-78	-0.3200%	-0.5600%	0.6500%	0.7242%	0.7433%	0.7338%	0.7733%	-0.9700%	-1.0538%	-1.3333%	11.95%	7.80%	8.81%	4.15%	3.15%
Oct-78	-8.7200%	-6.8400%	0.7300%	0.7408%	0.7558%	0.7483%	0.7883%	-9.4500%	-9.4683%	-7.6283%	6.34%	8.76%	8.98%	-2.42%	-2.64%
Nov-78	2.1500%	3.5600%	0.7100%	0.7525%	0.7700%	0.7613%	0.8067%	1.4400%	1.3888%	2.7533%	5.30%	8.52%	9.14%	-3.22%	-3.84%
Dec-78	1.9600%	-1.4900%	0.6800%	0.7633%	0.7775%	0.7704%	0.8083%	1.2800%	1.1896%	-2.2983%	6.56%	8.16%	9.25%	-1.60%	-2.69%
Jan-79	4.4300%	6.9200%	0.7900%	0.7708%	0.7900%	0.7804%	0.8250%	3.6400%	3.6496%	6.0950%	18.06%	9.48%	9.37%	8.58%	8.69%
Feb-79	-3.2100%	-2.1200%	0.6500%	0.7717%	0.7917%	0.7817%	0.8200%	-3.8600%	-3.9917%	-2.9400%	16.63%	7.80%	9.38%	8.83%	7.25%
Mar-79	5.9600%	1.9600%	0.7400%	0.7808%	0.8008%	0.7908%	0.8367%	5.2200%	5.1692%	1.1233%	20.06%	8.88%	9.49%	11.18%	10.57%
Apr-79	0.6300%	-2.4900%	0.7600%	0.7817%	0.8042%	0.7929%	0.8417%	-0.1300%	-0.1629%	-3.3317%	10.82%	9.12%	9.52%	1.70%	1.30%
May-79	-2.1700%	1.5000%	0.7700%	0.7917%	0.8217%	0.8067%	0.8583%	-2.9400%	-2.9767%	0.6417%	7.42%	9.24%	9.68%	-1.82%	-2.26%
Jun-79	4.3500%	3.8600%	0.7100%	0.7742%	0.8050%	0.7896%	0.8450%	3.6400%	3.5604%	3.0150%	13.67%	8.52%	9.48%	5.15%	4.19%
Jul-79	1.3400%	3.4200%	0.7600%	0.7667%	0.7908%	0.7788%	0.8317%	0.5800%	0.5613%	2.5883%	8.84%	9.12%	9.35%	-0.28%	-0.50%
Aug-79	5.7700%	1.0200%	0.7300%	0.7692%	0.7942%	0.7817%	0.8450%	5.0400%	4.9883%	0.1750%	11.76%	8.76%	9.38%	3.00%	2.38%
Sep-79	0.4300%	-1.7700%	0.6800%	0.7867%	0.8083%	0.7975%	0.8633%	-0.2500%	-0.3675%	-2.6333%	12.60%	8.16%	9.57%	4.44%	3.03%

	Market Return	S&P Return	Ibbot LT RF	Aaa Corp	Aa Corp	Avg Aaa and Aa Corp	A PU	RPMKT	RPAAAAA	RPSPA	Mkt Annlized Return	RF Annualized Yield	AAAAA Annualized Yield	MRP RP	AAAAA RP
Oct-79	-6.4000%	-5.0500%	0.8200%	0.8442%	0.8717%	0.8579%	0.9500%	-7.2200%	-7.2579%	-6.0000%	15.46%	9.84%	10.30%	5.62%	5.17%
Nov-79	4.7500%	6.0700%	0.8300%	0.8967%	0.9350%	0.9158%	0.9908%	3.9200%	3.8342%	5.0792%	18.40%	9.96%	10.99%	8.44%	7.41%
Dec-79	2.1400%	0.2200%	0.8300%	0.8950%	0.9292%	0.9121%	1.0125%	1.3100%	1.2279%	-0.7925%	18.61%	9.96%	10.95%	8.65%	7.67%
Jan-80	6.2200%	-0.2300%	0.8300%	0.9242%	0.9633%	0.9438%	1.0177%	5.3900%	5.2763%	-1.2477%	20.64%	9.96%	11.33%	10.68%	9.32%
Feb-80	-0.0100%	-2.4700%	0.8400%	1.0317%	1.0608%	1.0463%	1.1028%	-0.8500%	-1.0563%	-3.5728%	24.63%	10.08%	12.56%	14.55%	12.08%
Mar-80	-9.7200%	-5.2900%	0.9900%	1.0800%	1.1258%	1.1029%	1.2158%	-10.7100%	-10.8229%	-6.5058%	6.19%	11.88%	13.24%	-5.69%	-7.05%
Apr-80	4.6200%	11.8600%	1.0000%	1.0033%	1.0883%	1.0458%	1.1908%	3.6200%	3.5742%	10.6692%	10.40%	12.00%	12.55%	-1.60%	-2.15%
May-80	5.1500%	3.2300%	0.8700%	0.9158%	0.9925%	0.9542%	1.0613%	4.2800%	4.1958%	2.1687%	18.66%	10.44%	11.45%	8.22%	7.21%
Jun-80	3.1600%	3.3700%	0.8600%	0.8817%	0.9492%	0.9154%	1.0331%	2.3000%	2.2446%	2.3369%	17.31%	10.32%	10.99%	6.99%	6.32%
Jul-80	6.9600%	-0.4100%	0.8400%	0.9225%	0.9525%	0.9375%	1.0127%	6.1200%	6.0225%	-1.4227%	23.81%	10.08%	11.25%	13.73%	12.56%
Aug-80	1.0100%	-1.3900%	0.8100%	0.9700%	1.0075%	0.9888%	1.0550%	0.2000%	0.0212%	-2.4450%	18.24%	9.72%	11.87%	8.52%	6.38%
Sep-80	2.9400%	-1.1400%	0.9700%	1.0017%	1.0433%	1.0225%	1.1077%	1.9700%	1.9175%	-2.2477%	21.20%	11.64%	12.27%	9.56%	8.93%
Oct-80	2.0200%	2.7400%	0.9700%	1.0258%	1.0567%	1.0413%	1.1280%	1.0500%	0.9788%	1.6120%	32.10%	11.64%	12.50%	20.46%	19.60%
Nov-80	10.6500%	5.0100%	0.9100%	1.0808%	1.1117%	1.0963%	1.1677%	9.7400%	9.5538%	3.8423%	39.54%	10.92%	13.16%	28.62%	26.38%
Dec-80	-3.0200%	-0.1400%	1.0800%	1.1008%	1.1483%	1.1246%	1.2217%	-4.1000%	-4.1446%	-1.3617%	32.49%	12.96%	13.50%	19.53%	18.99%
Jan-81	-4.1800%	-1.8600%	0.9400%	1.0675%	1.1267%	1.0971%	1.1895%	-5.1200%	-5.2771%	-3.0495%	19.52%	11.28%	13.17%	8.24%	6.35%
Feb-81	1.7400%	-2.2400%	0.8800%	1.1125%	1.1575%	1.1350%	1.2233%	0.8600%	0.6050%	-3.4633%	21.61%	10.56%	13.62%	11.05%	7.99%
Mar-81	4.0000%	4.2000%	1.1100%	1.1108%	1.1583%	1.1346%	1.2604%	2.8900%	2.8654%	2.9396%	40.09%	13.32%	13.62%	26.77%	26.47%
Apr-81	-1.9300%	-0.9600%	1.0100%	1.1567%	1.1992%	1.1779%	1.2708%	-2.9400%	-3.1079%	-2.2308%	31.32%	12.12%	14.14%	19.20%	17.18%
May-81	0.2600%	2.9100%	1.0400%	1.1933%	1.2400%	1.2167%	1.3430%	-0.7800%	-0.9567%	1.5670%	25.21%	12.48%	14.60%	12.73%	10.61%
Jun-81	-0.6300%	2.7200%	1.0900%	1.1458%	1.2008%	1.1733%	1.3160%	-1.7200%	-1.8033%	1.4040%	20.61%	13.08%	14.08%	7.53%	6.53%
Jul-81	0.2100%	3.4100%	1.0900%	1.1983%	1.2325%	1.2154%	1.3393%	-0.8800%	-1.0054%	2.0707%	13.00%	13.08%	14.59%	-0.08%	-1.58%
Aug-81	-5.7700%	-0.2400%	1.1000%	1.2408%	1.2850%	1.2629%	1.3706%	-6.8700%	-7.0329%	-1.6106%	5.42%	13.20%	15.16%	-7.78%	-9.74%
Sep-81	-4.9300%	-4.0900%	1.1400%	1.2908%	1.3292%	1.3100%	1.4192%	-6.0700%	-6.2400%	-5.5092%	-2.64%	13.68%	15.72%	-16.32%	-18.36%
Oct-81	5.4000%	6.1700%	1.1700%	1.2833%	1.3183%	1.3008%	1.4379%	4.2300%	4.0992%	4.7321%	0.58%	14.04%	15.61%	-13.46%	-15.03%
Nov-81	4.1300%	4.8100%	1.1300%	1.1850%	1.2475%	1.2163%	1.3679%	3.0000%	2.9138%	3.4421%	-5.35%	13.56%	14.60%	-18.91%	-19.94%
Dec-81	-2.5600%	-3.0500%	1.0000%	1.1858%	1.2500%	1.2179%	1.3468%	-3.5600%	-3.7779%	-4.3968%	-4.90%	12.00%	14.62%	-16.90%	-19.51%
Jan-82	-1.3100%	0.3700%	1.0800%	1.2650%	1.3125%	1.2888%	1.4000%	-2.3900%	-2.5988%	-1.0300%	-2.05%	12.96%	15.47%	-15.01%	-17.51%
Feb-82	-5.5900%	-0.3500%	1.0300%	1.2725%	1.3100%	1.2913%	1.4096%	-6.6200%	-6.8813%	-1.7596%	-9.10%	12.36%	15.50%	-21.46%	-24.60%
Mar-82	-0.5200%	1.6800%	1.2400%	1.2150%	1.2675%	1.2413%	1.3740%	-1.7600%	-1.7613%	0.3060%	-13.06%	14.88%	14.90%	-27.94%	-27.95%
Apr-82	4.5200%	5.4800%	1.1200%	1.2050%	1.2417%	1.2233%	1.3665%	3.4000%	3.2967%	4.1135%	-7.34%	13.44%	14.68%	-20.78%	-22.02%
May-82	-3.4100%	-1.8700%	1.0100%	1.1883%	1.2308%	1.2096%	1.3400%	-4.4200%	-4.6196%	-3.2100%	-10.73%	12.12%	14.52%	-22.85%	-25.24%
Jun-82	-1.5000%	-1.6100%	1.2000%	1.2342%	1.2717%	1.2529%	1.3617%	-2.7000%	-2.7529%	-2.9717%	-11.51%	14.40%	15.04%	-25.91%	-26.55%
Jul-82	-1.7800%	-1.9800%	1.1400%	1.2175%	1.2675%	1.2425%	1.3717%	-2.9200%	-3.0225%	-3.3517%	-13.27%	13.68%	14.91%	-26.95%	-28.18%
Aug-82	12.1400%	12.1100%	1.1200%	1.1425%	1.2067%	1.1746%	1.3267%	11.0200%	10.9654%	10.7833%	3.22%	13.44%	14.10%	-10.22%	-10.88%
Sep-82	1.2500%	0.5200%	1.0000%	1.0783%	1.1433%	1.1108%	1.2875%	0.2500%	0.1392%	-0.7675%	9.93%	12.00%	13.33%	-2.07%	-3.40%
Oct-82	11.5100%	6.5900%	0.9100%	1.0100%	1.0808%	1.0454%	1.2487%	10.6000%	10.4646%	5.3413%	16.30%	10.92%	12.55%	5.38%	3.75%
Nov-82	4.0400%	0.1700%	0.9500%	0.9733%	1.0425%	1.0079%	1.2052%	3.0900%	3.0321%	-1.0352%	16.20%	11.40%	12.10%	4.80%	4.10%
Dec-82	1.9300%	3.6000%	0.9300%	0.9858%	1.0367%	1.0113%	1.2021%	1.0000%	0.9188%	2.3979%	21.55%	11.16%	12.14%	10.39%	9.42%
Jan-83	3.7200%	3.7200%	0.8700%	0.9825%	1.0292%	1.0058%	1.1868%	2.8500%	2.7142%	2.5333%	27.75%	10.44%	12.07%	17.31%	15.68%
Feb-83	2.2900%	-0.0500%	0.8100%	1.0008%	1.0483%	1.0246%	1.1898%	1.4800%	1.2654%	-1.2398%	38.41%	9.72%	12.30%	28.69%	26.12%
Mar-83	3.6900%	0.1700%	0.8900%	0.9775%	1.0267%	1.0021%	1.1690%	2.8000%	2.6879%	-0.9990%	44.27%	10.68%	12.03%	33.59%	32.24%
Apr-83	7.8800%	5.7100%	0.8500%	0.9592%	1.0050%	0.9821%	1.1365%	7.0300%	6.8979%	4.5735%	48.91%	10.20%	11.79%	38.71%	37.12%
May-83	-0.8700%	1.2400%	0.9100%	0.9550%	0.9958%	0.9754%	1.1243%	-1.7800%	-1.8454%	0.1157%	52.82%	10.92%	11.71%	41.90%	41.12%
Jun-83	3.8900%	-1.2300%	0.9000%	0.9783%	1.0125%	0.9954%	1.1373%	2.9900%	2.8946%	-2.3673%	61.18%	10.80%	11.95%	50.38%	49.24%
Jul-83	-2.9500%	3.3900%	0.8800%	1.0125%	1.0325%	1.0225%	1.1310%	-3.8300%	-3.9725%	2.2590%	59.26%	10.56%	12.27%	48.70%	46.99%
Aug-83	1.5000%	0.4000%	1.0300%	1.0425%	1.0600%	1.0513%	1.1306%	0.4700%	0.4488%	-0.7306%	44.15%	12.36%	12.62%	31.79%	31.54%
Sep-83	1.3800%	4.4500%	0.9600%	1.0308%	1.0517%	1.0413%	1.1197%	0.4200%	0.3388%	3.3303%	44.34%	11.52%	12.50%	32.82%	31.84%
Oct-83	-1.1600%	5.3200%	0.9500%	1.0208%	1.0408%	1.0308%	1.1044%	-2.1100%	-2.1908%	4.2156%	27.94%	11.40%	12.37%	16.54%	15.57%
Nov-83	2.1100%	-2.0400%	0.9400%	1.0342%	1.0508%	1.0425%	1.1153%	1.1700%	1.0675%	-3.1553%	25.57%	11.28%	12.51%	14.29%	13.06%
Dec-83	-0.5200%	-2.2600%	0.9400%	1.0475%	1.0633%	1.0554%	1.1264%	-1.4600%	-1.5754%	-3.3864%	22.55%	11.28%	12.67%	11.27%	9.88%
Jan-84	-0.5600%	4.8200%	1.0300%	1.0167%	1.0592%	1.0379%	1.1167%	-1.5900%	-1.5979%	3.7033%	17.49%	12.36%	12.46%	5.13%	5.04%
Feb-84	-3.5200%	-4.1100%	0.9200%	1.0067%	1.0583%	1.0325%	1.1164%	-4.4400%	-4.5525%	-5.2264%	10.82%	11.04%	12.39%	-0.22%	-1.57%
Mar-84	1.7300%	-0.5500%	0.9800%	1.0475%	1.1017%	1.0746%	1.1477%	0.7500%	0.6554%	-1.6977%	8.72%	11.76%	12.90%	-3.04%	-4.17%
Apr-84	0.9500%	1.5900%	1.0400%	1.0675%	1.1233%	1.0954%	1.1774%	-0.0900%	-0.1454%	0.4126%	1.74%	12.48%	13.15%	-10.74%	-11.41%
May-84	-5.5400%	-2.3000%	1.0300%	1.1067%	1.1750%	1.1408%	1.2400%	-6.5700%	-6.6808%	-3.5400%	-3.05%	12.36%	13.69%	-15.41%	-16.74%
Jun-84	2.1700%	0.6900%	1.0600%	1.1292%	1.1942%	1.1617%	1.2581%	1.1100%	1.0083%	-0.5681%	-4.66%	12.72%	13.94%	-17.38%	-18.60%
Jul-84	-1.2400%	4.3300%	1.1600%	1.1200%	1.1767%	1.1483%	1.2384%	-2.4000%	-2.3883%	3.0916%	-2.98%	13.92%	13.78%	-16.90%	-16.76%
Aug-84	11.0400%	6.4600%	1.0600%	1.0725%	1.1225%	1.0975%	1.2024%	9.9800%	9.9425%	5.2576%	6.14%	12.72%	13.17%	-6.58%	-7.03%
Sep-84	0.0200%	4.3800%	0.9400%	1.0550%	1.1058%	1.0804%	1.1823%	-0.9200%	-1.0604%	3.1977%	4.72%	11.28%	12.97%	-6.56%	-8.25%
Oct-84	0.3900%	2.7200%	1.0800%	1.0525%	1.0925%	1.0725%	1.1525%	-0.6900%	-0.6825%	1.5675%	6.36%	12.96%	12.87%	-6.60%	-6.51%
Nov-84	-1.1200%	2.7000%	0.9100%	1.0242%	1.0550%	1.0396%	1.1039%	-2.0300%	-2.1596%	1.5961%	2.99%	10.92%	12.48%	-7.93%	-9.48%
Dec-84	2.6300%	3.1600%	0.9800%	1.0108%	1.0417%	1.0263%	1.0891%	1.6500%	1.6038%	2.0709%	6.25%	11.76%	12.32%	-5.51%	-6.06%
Jan-85	7.7900%	2.3500%	0.9600%	1.0067%	1.0358%	1.0213%	1.0822%	6.8300%	6.7688%	1.2678%	15.18%	11.52%	12.26%	3.66%	2.92%
Feb-85	1.2200%	1.9300%	0.8200%	1.0108%	1.0408%	1.0258%	1.0862%	0.4000%	0.1942%	0.8438%	20.83%	9.84%	12.31%	10.99%	8.52%
Mar-85	0.0700%	3.6200%	0.9400%	1.0467%	1.0758%	1.0613%	1.1501%	-0.8700%	-0.9913%	2.4699%	18.86%	11.28%	12.74%	7.58%	6.13%
Apr-85	-0.0900%	2.0700%	1.0200%	1.0192%	1.0575%	1.0383%	1.1322%	-1.1100%	-1.1283%	0.9378%	17.64%	12.24%	12.46%	5.40%	5.18%
May-85	5.7800%	6.0600%	0.9700%	0.9767%	1.0250%	1.0008%	1.0978%	4.8100%	4.7792%	4.9622%	31.74%	11.64%	12.01%	20.10%	19.73%
Jun-85	1.5700%	2.7900%	0.8000%	0.9117%	0.9550%	0.9333%	1.0120%	0.7700%	0.6367%	1.7780%	30.96%	9.60%	11.20%	21.36%	19.76%
Jul-85	-0.1500%	-4.2700%	0.9400%	0.9142%	0.9517%	0.9329%	1.0054%	-1.0900%	-1.0829%	-5.2754%	32.41%	11.28%	11.20%	21.13%	21.21%
Aug-85	-0.8500%	1.8100%	0.8500%	0.9208%	0.9558%	0.9383%	1.0114%	-1.7000%	-1.7883%	0.7986%	18.23%	10.20%	11.26%	8.03%	6.97%
Sep-85	-3.1300%	-5.2100%	0.8800%	0.9225%	0.9550%	0.9388%	1.0110%	-4.0100%	-4.0688%	-6.2210%	14.51%	10.56%	11.27%	3.95%	3.24%
Oct-85	4.6200%	6.3800%	0.8900%	0.9183%	0.9542%	0.9363%	1.0012%	3.7300%	3.6838%	5.3788%	19.33%	10.68%	11.24%	8.65%	8.10%
Nov-85	6.8600%	5.2200%	0.8100%	0.8792%	0.9225%	0.9008%	0.9595%	6.0500%	5.9592%	4.2605%	28.96%	9.72%	10.81%	19.24%	18.15%
Dec-85	4.8400%	6.9400%	0.8600%	0.8467%	0.8858%	0.8663%	0.9173%	3.9800%	3.9738%	6.0227%	31.74%	10.32%	10.40%	21.42%	21.34%
Jan-86	0.5600%	2.9300%	0.7900%	0.8375%	0.8717%	0.8546%	0.8999%	-0.2300%	-0.2946%	2.0301%	22.90%	9.48%	10.26%	13.42%	12.65%
Feb-86	7.4700%	6.2300%	0.7300%	0.8058%	0.8442%	0.8250%	0.8597%	6.7400%	6.6450%	5.3703%	30.49%	8.76%	9.90%	21.73%	20.59%
Mar-86	5.5800%	5.1400%	0.7100%	0.7500%	0.7908%	0.7704%	0.7928%	4.8700%	4.8096%	4.3473%	37.68%	8.52%	9.25%	29.16%	28.43%
Apr-86	-1.1300%	-3.3300%	0.6300%	0.7325%	0.7675%	0.7500%	0.7609%	-1.7600%	-1.8800%	-4.0909%	36.24%	7.56%	9.00%	28.68%	27.24%
May-86	5.3200%	5.2500%	0.6200%	0.7575%	0.7858%	0.7717%	0.7972%	4.7000%	4.5483%	4.4528%	35.65%	7.44%	9.26%	28.21%	26.39%
Jun-86	1.6900%	5.9700%	0.7000%	0.7608%	0.7908%	0.7758%	0.8046%	0.9900%	0.9142%	5.1654%	35.81%	8.40%	9.31%	27.41%	26.50%

	Market Return	S&P Return	Ibbot LT RF	Aaa Corp	Aa Corp	Avg Aaa and Aa Corp	A PU	RPMKT	RPAAAAA	RPSPA	Mkt Annlized Return	RF Annualized Yield	AAAAA Annualized Yield	MRP RP	AAAAA RP
Jul-86	-5.5900%	2.8300%	0.6600%	0.7400%	0.7733%	0.7567%	0.7795%	-6.2500%	-6.3467%	2.0505%	28.41%	7.92%	9.08%	20.49%	19.33%
Aug-86	7.4200%	8.8400%	0.6300%	0.7267%	0.7683%	0.7475%	0.7756%	6.7900%	6.6725%	8.0644%	39.12%	7.56%	8.97%	31.56%	30.15%
Sep-86	-8.2700%	-11.3700%	0.6500%	0.7408%	0.7800%	0.7604%	0.7919%	-8.9200%	-9.0304%	-12.1619%	31.74%	7.80%	9.13%	23.94%	22.62%
Oct-86	5.7700%	5.0500%	0.6900%	0.7383%	0.7775%	0.7579%	0.7940%	5.0800%	5.0121%	4.2561%	33.19%	8.28%	9.10%	24.91%	24.09%
Nov-86	2.4300%	2.1100%	0.5900%	0.7233%	0.7667%	0.7450%	0.7745%	1.8400%	1.6850%	1.3355%	27.67%	7.08%	8.94%	20.59%	18.73%
Dec-86	-2.5500%	-2.5400%	0.7000%	0.7075%	0.7517%	0.7296%	0.7600%	-3.2500%	-3.2796%	-3.3000%	18.67%	8.40%	8.76%	10.27%	9.91%
Jan-87	13.4700%	9.8400%	0.6400%	0.6967%	0.7383%	0.7175%	0.7454%	12.8300%	12.7525%	9.0946%	33.90%	7.68%	8.61%	26.22%	25.29%
Feb-87	3.9500%	-3.0100%	0.5900%	0.6983%	0.7400%	0.7192%	0.7503%	3.3600%	3.2308%	-3.7603%	29.52%	7.08%	8.63%	22.44%	20.89%
Mar-87	2.8900%	-1.8900%	0.6600%	0.6967%	0.7367%	0.7167%	0.7441%	2.2300%	2.1733%	-2.6341%	26.22%	7.92%	8.60%	18.30%	17.62%
Apr-87	-0.8900%	-4.1400%	0.6500%	0.7375%	0.7625%	0.7500%	0.7794%	-1.5400%	-1.6400%	-4.9194%	26.52%	7.80%	9.00%	18.72%	17.52%
May-87	0.8700%	-0.6400%	0.6600%	0.7775%	0.7992%	0.7883%	0.8221%	0.2100%	0.0817%	-1.4621%	21.18%	7.92%	9.46%	13.26%	11.72%
Jun-87	5.0500%	4.3900%	0.7500%	0.7767%	0.8042%	0.7904%	0.8349%	4.3000%	4.2596%	3.5552%	25.18%	9.00%	9.49%	16.18%	15.70%
Jul-87	5.0700%	-0.2500%	0.7300%	0.7850%	0.8042%	0.7946%	0.8446%	4.3400%	4.2754%	-1.0946%	39.32%	8.76%	9.54%	30.56%	29.78%
Aug-87	3.7300%	5.2700%	0.7500%	0.8058%	0.8217%	0.8138%	0.8703%	2.9800%	2.9163%	4.3997%	34.53%	9.00%	9.77%	25.53%	24.77%
Sep-87	-2.1900%	0.2100%	0.7500%	0.8483%	0.8625%	0.8554%	0.9314%	-2.9400%	-3.0454%	-0.7214%	43.45%	9.00%	10.27%	34.45%	33.18%
Oct-87	-21.5400%	-7.0500%	0.7900%	0.8767%	0.8950%	0.8858%	0.9466%	-22.3300%	-22.4258%	-7.9966%	6.41%	9.48%	10.63%	-3.07%	-4.22%
Nov-87	-8.2400%	-5.5500%	0.7500%	0.8342%	0.8558%	0.8450%	0.9020%	-8.9900%	-9.0850%	-6.4520%	-4.68%	9.00%	10.14%	-13.68%	-14.82%
Dec-87	7.6100%	1.0800%	0.7800%	0.8425%	0.8608%	0.8517%	0.9114%	6.8300%	6.7583%	0.1686%	5.26%	9.36%	10.22%	-4.10%	-4.96%
Jan-88	4.2100%	11.5300%	0.7200%	0.8233%	0.8408%	0.8321%	0.8998%	3.4900%	3.3779%	10.6302%	-3.33%	8.64%	9.99%	-11.97%	-13.31%
Feb-88	4.6600%	-1.7500%	0.7100%	0.7833%	0.8000%	0.7917%	0.8430%	3.9500%	3.8683%	-2.5930%	-2.67%	8.52%	9.50%	-11.19%	-12.17%
Mar-88	-3.0900%	-5.2700%	0.7200%	0.7825%	0.7992%	0.7908%	0.8396%	-3.8100%	-3.8808%	-6.1096%	-8.32%	8.64%	9.49%	-16.96%	-17.81%
Apr-88	1.1100%	0.1900%	0.7000%	0.8058%	0.8217%	0.8138%	0.8768%	0.4100%	0.2963%	-0.6868%	-6.47%	8.40%	9.77%	-14.87%	-16.24%
May-88	0.8600%	4.6000%	0.7800%	0.8250%	0.8417%	0.8333%	0.8993%	0.0800%	0.0267%	3.7007%	-6.48%	9.36%	10.00%	-15.84%	-16.48%
Jun-88	4.5900%	3.1500%	0.7600%	0.8217%	0.8442%	0.8329%	0.9005%	3.8300%	3.7571%	2.2495%	-6.89%	9.12%	10.00%	-16.01%	-16.89%
Jul-88	-0.3800%	0.1700%	0.7100%	0.8300%	0.8550%	0.8425%	0.9187%	-1.0900%	-1.2225%	-0.7487%	-11.72%	8.52%	10.11%	-20.24%	-21.83%
Aug-88	-3.3900%	-1.3700%	0.8300%	0.8425%	0.8642%	0.8533%	0.9308%	-4.2200%	-4.2433%	-2.3008%	-17.78%	9.96%	10.24%	-27.74%	-28.02%
Sep-88	4.2600%	4.1300%	0.7600%	0.8183%	0.8383%	0.8283%	0.8889%	3.5000%	3.4317%	3.2412%	-12.36%	9.12%	9.94%	-21.48%	-22.30%
Oct-88	2.7800%	2.6200%	0.7600%	0.7917%	0.8083%	0.8000%	0.8318%	2.0200%	1.9800%	1.7882%	14.81%	9.12%	9.60%	5.69%	5.21%
Nov-88	-1.4300%	-0.7900%	0.7000%	0.7875%	0.8100%	0.7988%	0.8242%	-2.1300%	-2.2288%	-1.6142%	23.33%	8.40%	9.59%	14.93%	13.74%
Dec-88	1.7400%	0.6300%	0.7500%	0.7975%	0.8175%	0.8075%	0.8377%	0.9900%	0.9325%	-0.2077%	16.60%	9.00%	9.69%	7.60%	6.91%
Jan-89	7.3200%	5.7100%	0.8000%	0.8017%	0.8175%	0.8096%	0.8404%	6.5200%	6.5104%	4.8696%	20.08%	9.60%	9.72%	10.48%	10.36%
Feb-89	-2.4900%	-2.1500%	0.6900%	0.8033%	0.8192%	0.8113%	0.8383%	-3.1800%	-3.3013%	-2.9883%	11.88%	8.28%	9.74%	3.60%	2.14%
Mar-89	2.3300%	2.6900%	0.7900%	0.8167%	0.8317%	0.8242%	0.8535%	1.5400%	1.5058%	1.8366%	18.13%	9.48%	9.89%	8.65%	8.24%
Apr-89	5.1900%	6.3400%	0.7000%	0.8158%	0.8283%	0.8221%	0.8492%	4.4900%	4.3679%	5.4908%	22.90%	8.40%	9.87%	14.50%	13.03%
May-89	4.0500%	5.8000%	0.8000%	0.7975%	0.8125%	0.8050%	0.8334%	3.2500%	3.2450%	4.9666%	26.79%	9.60%	9.66%	17.19%	17.13%
Jun-89	-0.5700%	1.6100%	0.7000%	0.7583%	0.7742%	0.7663%	0.8049%	-1.2700%	-1.3363%	0.8052%	20.53%	8.40%	9.20%	12.13%	11.34%
Jul-89	9.0300%	8.0400%	0.6800%	0.7442%	0.7617%	0.7529%	0.7920%	8.3500%	8.2771%	7.2480%	31.92%	8.16%	9.04%	23.76%	22.88%
Aug-89	1.9500%	-0.5700%	0.6600%	0.7467%	0.7617%	0.7542%	0.7929%	1.2900%	1.1958%	-1.3629%	39.21%	7.92%	9.05%	31.29%	30.16%
Sep-89	-0.4100%	1.7000%	0.6500%	0.7508%	0.7692%	0.7600%	0.7987%	-1.0600%	-1.1700%	0.9013%	32.97%	7.80%	9.12%	25.17%	23.85%
Oct-89	-2.3200%	0.4500%	0.7200%	0.7433%	0.7658%	0.7546%	0.7949%	-3.0400%	-3.0746%	-0.3449%	26.37%	8.64%	9.06%	17.73%	17.32%
Nov-89	2.0400%	3.3600%	0.6400%	0.7408%	0.7617%	0.7513%	0.7930%	1.4000%	1.2888%	2.5670%	30.82%	7.68%	9.02%	23.14%	21.81%
Dec-89	2.4000%	7.3100%	0.6400%	0.7383%	0.7592%	0.7488%	0.7861%	1.7600%	1.6513%	6.5239%	31.67%	7.68%	8.99%	23.99%	22.69%
Jan-90	-6.7100%	-8.0900%	0.7300%	0.7492%	0.7725%	0.7608%	0.7956%	-7.4400%	-7.4708%	-8.8856%	14.46%	8.76%	9.13%	5.70%	5.33%
Feb-90	1.2900%	-1.0900%	0.6600%	0.7683%	0.7867%	0.7775%	0.8130%	0.6300%	0.5125%	-1.9030%	18.90%	7.92%	9.33%	10.98%	9.57%
Mar-90	2.6500%	1.8700%	0.7100%	0.7808%	0.7925%	0.7867%	0.8205%	1.9400%	1.8633%	1.0495%	19.27%	8.52%	9.44%	10.75%	9.83%
Apr-90	-2.4900%	-3.8500%	0.7500%	0.7883%	0.8033%	0.7958%	0.8259%	-3.2400%	-3.2858%	-4.6759%	10.56%	9.00%	9.55%	1.56%	1.01%
May-90	9.7500%	6.8200%	0.7500%	0.7892%	0.8083%	0.7988%	0.8338%	9.0000%	8.9513%	5.9862%	16.62%	9.00%	9.59%	7.62%	7.03%
Jun-90	-0.6700%	-2.1100%	0.6800%	0.7717%	0.7908%	0.7813%	0.8175%	-1.3500%	-1.4513%	-2.9275%	16.50%	8.16%	9.38%	8.34%	7.12%
Jul-90	-0.3200%	-0.3200%	0.7400%	0.7700%	0.7892%	0.7796%	0.8132%	-1.0600%	-1.0996%	-1.1332%	6.51%	8.88%	9.36%	-2.37%	-2.85%
Aug-90	-9.0400%	-7.9200%	0.7100%	0.7842%	0.8025%	0.7933%	0.8246%	-9.7500%	-9.8333%	-8.7446%	-4.97%	8.52%	9.52%	-13.49%	-14.49%
Sep-90	-4.8700%	4.1100%	0.6900%	0.7967%	0.8142%	0.8054%	0.8431%	-5.5600%	-5.6754%	3.2669%	-9.23%	8.28%	9.67%	-17.51%	-18.89%
Oct-90	-0.4300%	6.5300%	0.8100%	0.7942%	0.8142%	0.8042%	0.8386%	-1.2400%	-1.2342%	5.6915%	-7.47%	9.72%	9.65%	-17.19%	-17.12%
Nov-90	6.4600%	1.9300%	0.7100%	0.7750%	0.7992%	0.7871%	0.8260%	5.7500%	5.6729%	1.1040%	-3.46%	8.52%	9.45%	-11.98%	-12.91%
Dec-90	2.7900%	0.8600%	0.7200%	0.7542%	0.7825%	0.7683%	0.8109%	2.0700%	2.0217%	0.0491%	-3.10%	8.64%	9.22%	-11.74%	-12.32%
Jan-91	4.3600%	-3.0100%	0.7100%	0.7533%	0.7808%	0.7671%	0.8094%	3.6500%	3.5929%	-3.8194%	8.40%	8.52%	9.21%	-0.12%	-0.80%
Feb-91	7.1500%	3.4900%	0.6400%	0.7358%	0.7633%	0.7496%	0.7898%	6.5100%	6.4004%	2.7002%	14.67%	7.68%	9.00%	6.99%	5.68%
Mar-91	2.4200%	1.9800%	0.6400%	0.7442%	0.7675%	0.7558%	0.7961%	1.7800%	1.6642%	1.1839%	14.42%	7.68%	9.07%	6.74%	5.35%
Apr-91	0.2400%	-1.6200%	0.7600%	0.7383%	0.7600%	0.7492%	0.7887%	-0.5200%	-0.5092%	-2.4087%	17.62%	9.12%	8.99%	8.50%	8.63%
May-91	4.3100%	-1.3000%	0.6800%	0.7383%	0.7625%	0.7504%	0.7860%	3.6300%	3.5596%	-2.0860%	11.79%	8.16%	9.01%	3.63%	2.78%
Jun-91	-4.5800%	-1.3900%	0.6300%	0.7508%	0.7733%	0.7621%	0.7986%	-5.2100%	-5.3421%	-2.1886%	7.39%	7.56%	9.15%	-0.17%	-1.76%
Jul-91	4.6600%	3.0700%	0.7600%	0.7500%	0.7708%	0.7604%	0.7956%	3.9000%	3.8996%	2.2744%	12.75%	9.12%	9.13%	3.63%	3.63%
Aug-91	2.3700%	2.5800%	0.6800%	0.7292%	0.7492%	0.7392%	0.7754%	1.6900%	1.6308%	1.8046%	26.90%	8.16%	8.87%	18.74%	18.03%
Sep-91	-1.6700%	2.0200%	0.6800%	0.7175%	0.7383%	0.7279%	0.7638%	-2.3500%	-2.3979%	1.2562%	31.17%	8.16%	8.74%	23.01%	22.43%
Oct-91	1.3400%	2.0000%	0.6500%	0.7125%	0.7358%	0.7242%	0.7601%	0.6900%	0.6158%	1.2399%	33.50%	7.80%	8.69%	25.70%	24.81%
Nov-91	-4.0300%	-0.9800%	0.6000%	0.7067%	0.7317%	0.7192%	0.7545%	-4.6300%	-4.7492%	-1.7345%	20.34%	7.20%	8.63%	13.14%	11.71%
Dec-91	11.4400%	7.3300%	0.6800%	0.6925%	0.7175%	0.7050%	0.7416%	10.7600%	10.7350%	6.5884%	30.47%	8.16%	8.46%	22.31%	22.01%
Jan-92	-1.8600%	-5.3600%	0.6100%	0.6833%	0.7092%	0.6963%	0.7360%	-2.4700%	-2.5563%	-6.0960%	22.69%	7.32%	8.36%	15.37%	14.34%
Feb-92	1.3000%	-2.7300%	0.5900%	0.6908%	0.7225%	0.7067%	0.7442%	0.7100%	0.5933%	-3.4742%	16.00%	7.08%	8.48%	8.92%	7.52%
Mar-92	-1.9400%	-1.4300%	0.6700%	0.6958%	0.7275%	0.7117%	0.7473%	-2.6100%	-2.6517%	-2.1773%	11.06%	8.04%	8.54%	3.02%	2.52%
Apr-92	2.9400%	6.4500%	0.6500%	0.6942%	0.7242%	0.7092%	0.7438%	2.2900%	2.2308%	5.7062%	14.05%	7.80%	8.51%	6.25%	5.54%
May-92	0.4900%	-0.1500%	0.6100%	0.6900%	0.7192%	0.7046%	0.7400%	-0.1200%	-0.2146%	-0.8900%	9.87%	7.32%	8.46%	2.55%	1.42%
Jun-92	-1.4900%	1.4100%	0.6700%	0.6850%	0.7133%	0.6992%	0.7323%	-2.1600%	-2.1892%	0.6777%	13.43%	8.04%	8.39%	5.39%	5.04%
Jul-92	4.0900%	7.9000%	0.6300%	0.6725%	0.6975%	0.6850%	0.7149%	3.4600%	3.4050%	7.1851%	12.81%	7.56%	8.22%	5.25%	4.59%
Aug-92	-2.0500%	-0.7400%	0.6000%	0.6625%	0.6842%	0.6733%	0.7031%	-2.6500%	-2.7233%	-1.4431%	7.94%	7.20%	8.08%	0.74%	-0.14%
Sep-92	1.1800%	0.7300%	0.5800%	0.6600%	0.6808%	0.6704%	0.7006%	0.6000%	0.5096%	0.0294%	11.07%	6.96%	8.05%	4.11%	3.03%
Oct-92	0.3500%	-0.9400%	0.5700%	0.6658%	0.6933%	0.6796%	0.7106%	-0.2200%	-0.3296%	-1.6506%	9.99%	6.84%	8.16%	3.15%	1.83%
Nov-92	3.4100%	-0.1500%	0.6100%	0.6750%	0.7000%	0.6875%	0.7193%	2.8000%	2.7225%	-0.8693%	18.51%	7.32%	8.25%	11.19%	10.26%
Dec-92	1.2300%	3.5800%	0.6300%	0.6650%	0.6867%	0.6758%	0.7042%	0.6000%	0.5542%	2.8758%	7.65%	7.56%	8.11%	0.09%	-0.46%
Jan-93	0.8400%	1.5700%	0.5900%	0.6592%	0.6758%	0.6675%	0.6901%	0.2500%	0.1725%	0.8799%	10.62%	7.08%	8.01%	3.54%	2.61%
Feb-93	1.3600%	7.2100%	0.5500%	0.6425%	0.6583%	0.6504%	0.6704%	0.8100%	0.7096%	6.5396%	10.68%	6.60%	7.81%	4.08%	2.88%
Mar-93	2.1100%	1.8000%	0.6300%	0.6317%	0.6433%	0.6375%	0.6586%	1.4800%	1.4725%	1.1415%	15.25%	7.56%	7.65%	7.69%	7.60%

	Market Return	S&P Return	Ibbot LT RF	Aaa Corp	Aa Corp	Avg Aaa and Aa Corp	A PU	RPMKT	RPAAAAA	RPSPA	Mkt Annlized Return	RF Annualized Yield	AAAAA Annualized Yield	MRP RP	AAAAA RP
Apr-93	-2.4200%	-0.2700%	0.5700%	0.6217%	0.6350%	0.6283%	0.6515%	-2.9900%	-3.0483%	-0.9215%	9.25%	6.84%	7.54%	2.41%	1.71%
May-93	2.6800%	-1.9100%	0.5200%	0.6192%	0.6342%	0.6267%	0.6549%	2.1600%	2.0533%	-2.5649%	11.63%	6.24%	7.52%	5.39%	4.11%
Jun-93	0.2900%	4.6300%	0.6200%	0.6108%	0.6258%	0.6183%	0.6469%	-0.3300%	-0.3283%	3.9831%	13.65%	7.44%	7.42%	6.21%	6.23%
Jul-93	-0.4000%	2.2600%	0.5400%	0.5975%	0.6125%	0.6050%	0.6285%	-0.9400%	-1.0050%	1.6316%	8.75%	6.48%	7.26%	2.27%	1.49%
Aug-93	3.7900%	4.8400%	0.5600%	0.5708%	0.5883%	0.5796%	0.6059%	3.2300%	3.2104%	4.2341%	15.23%	6.72%	6.96%	8.51%	8.28%
Sep-93	-0.7700%	-0.2000%	0.5000%	0.5550%	0.5708%	0.5629%	0.5864%	-1.2700%	-1.3329%	-0.7864%	13.01%	6.00%	6.76%	7.01%	6.26%
Oct-93	2.0700%	-0.2100%	0.4900%	0.5558%	0.5725%	0.5642%	0.5857%	1.5800%	1.5058%	-0.7957%	14.95%	5.88%	6.77%	9.07%	8.18%
Nov-93	-0.9500%	-5.0700%	0.5300%	0.5775%	0.5933%	0.5854%	0.6067%	-1.4800%	-1.5354%	-5.6767%	10.10%	6.36%	7.03%	3.74%	3.08%
Dec-93	1.2100%	-0.5300%	0.5500%	0.5775%	0.5933%	0.5854%	0.6113%	0.6600%	0.6246%	-1.1413%	10.08%	6.60%	7.03%	3.48%	3.05%
Jan-94	3.4000%	0.7200%	0.5500%	0.5767%	0.5933%	0.5850%	0.6110%	2.8500%	2.8150%	0.1090%	12.87%	6.60%	7.02%	6.27%	5.85%
Feb-94	-2.7100%	-5.6700%	0.4900%	0.5900%	0.6075%	0.5988%	0.6205%	-3.2000%	-3.3088%	-6.2905%	8.34%	5.88%	7.19%	2.46%	1.16%
Mar-94	-4.3600%	-3.3800%	0.5800%	0.5900%	0.6075%	0.5988%	0.6528%	-4.9400%	-4.9588%	-4.0328%	1.48%	6.96%	7.19%	-5.48%	-5.71%
Apr-94	1.2800%	2.4600%	0.5700%	0.6233%	0.6408%	0.6321%	0.6851%	0.7100%	0.6479%	1.7749%	5.32%	6.84%	7.59%	-1.52%	-2.26%
May-94	1.6400%	-2.6800%	0.6300%	0.6658%	0.6825%	0.6742%	0.6939%	1.0100%	0.9658%	-3.3739%	4.26%	7.56%	8.09%	-3.30%	-3.83%
Jun-94	-2.4500%	0.2100%	0.6100%	0.6642%	0.6808%	0.6725%	0.6923%	-3.0600%	-3.1225%	-0.4823%	1.41%	7.32%	8.07%	-5.91%	-6.66%
Jul-94	3.2800%	3.3600%	0.6000%	0.6758%	0.6925%	0.6842%	0.7063%	2.6800%	2.5958%	2.6537%	5.16%	7.20%	8.21%	-2.04%	-3.05%
Aug-94	4.1000%	-0.2800%	0.6600%	0.6725%	0.6875%	0.6800%	0.7006%	3.4400%	3.4200%	-0.9806%	5.47%	7.92%	8.16%	-2.45%	-2.69%
Sep-94	-2.4500%	-2.5400%	0.6100%	0.6950%	0.7075%	0.7013%	0.7187%	-3.0600%	-3.1513%	-3.2587%	3.68%	7.32%	8.42%	-3.64%	-4.73%
Oct-94	2.2500%	0.8600%	0.6600%	0.7142%	0.7258%	0.7200%	0.7377%	1.5900%	1.5300%	0.1223%	3.87%	7.92%	8.64%	-4.05%	-4.77%
Nov-94	-3.6400%	-1.4600%	0.6400%	0.7233%	0.7358%	0.7296%	0.7486%	-4.2800%	-4.3696%	-2.2086%	1.05%	7.68%	8.76%	-6.63%	-7.71%
Dec-94	1.4800%	0.5200%	0.6600%	0.7050%	0.7183%	0.7117%	0.7307%	0.8200%	0.7683%	-0.2107%	1.32%	7.92%	8.54%	-6.60%	-7.22%
Jan-95	2.5900%	7.7900%	0.7000%	0.7050%	0.7167%	0.7108%	0.7288%	1.8900%	1.8792%	7.0612%	0.52%	8.40%	8.53%	-7.88%	-8.01%
Feb-95	3.9000%	-0.1500%	0.5900%	0.6883%	0.6992%	0.6938%	0.7108%	3.1100%	3.2063%	-0.8608%	7.35%	7.08%	8.33%	0.27%	-0.97%
Mar-95	2.9500%	-0.6000%	0.6400%	0.6767%	0.6867%	0.6817%	0.6979%	2.3100%	2.2683%	-1.2979%	15.56%	7.68%	8.18%	7.88%	7.38%
Apr-95	2.9400%	3.6500%	0.5800%	0.6692%	0.6767%	0.6729%	0.6898%	2.3600%	2.2671%	2.9602%	17.45%	6.96%	8.08%	10.49%	9.38%
May-95	4.0000%	3.1600%	0.6500%	0.6375%	0.6450%	0.6413%	0.6610%	3.3500%	3.3588%	2.4990%	20.18%	7.80%	7.70%	12.38%	12.48%
Jun-95	2.3200%	0.4700%	0.5400%	0.6083%	0.6192%	0.6138%	0.6336%	1.7800%	1.7063%	-0.1636%	26.05%	6.48%	7.37%	19.57%	18.69%
Jul-95	3.3200%	2.5500%	0.5600%	0.6175%	0.6283%	0.6229%	0.6408%	2.7600%	2.6971%	1.9092%	26.10%	6.72%	7.48%	19.38%	18.63%
Aug-95	0.2500%	2.0200%	0.5700%	0.6308%	0.6408%	0.6358%	0.6532%	-0.3200%	-0.3858%	1.3668%	21.44%	6.84%	7.63%	14.60%	13.81%
Sep-95	4.2200%	6.3800%	0.5200%	0.6100%	0.6208%	0.6154%	0.6350%	3.7000%	3.6046%	5.7450%	29.74%	6.24%	7.39%	23.50%	22.36%
Oct-95	-0.3600%	2.3800%	0.5700%	0.5933%	0.6058%	0.5996%	0.6224%	-0.9300%	-0.9596%	1.7576%	26.43%	6.84%	7.20%	19.59%	19.24%
Nov-95	4.3900%	1.3600%	0.5100%	0.5850%	0.5983%	0.5917%	0.6200%	3.8800%	3.7983%	0.7400%	36.97%	6.12%	7.10%	30.85%	29.87%
Dec-95	1.9300%	7.0800%	0.4900%	0.5683%	0.5825%	0.5754%	0.6045%	1.4400%	1.3546%	6.4755%	37.57%	5.88%	6.91%	31.69%	30.67%
Jan-96	3.4000%	1.2900%	0.5400%	0.5675%	0.5825%	0.5750%	0.6006%	2.8600%	2.8250%	0.6894%	38.66%	6.48%	6.90%	32.18%	31.76%
Feb-96	0.9300%	-3.9500%	0.4800%	0.5825%	0.5967%	0.5896%	0.6125%	0.4500%	0.3404%	-4.5625%	34.70%	5.76%	7.08%	28.94%	27.62%
Mar-96	0.9600%	-2.0300%	0.5200%	0.6125%	0.6267%	0.6196%	0.6435%	0.4400%	0.3404%	-2.6735%	32.09%	6.24%	7.44%	25.85%	24.66%
Apr-96	1.4700%	1.1000%	0.5900%	0.6250%	0.6400%	0.6325%	0.6570%	0.8800%	0.8375%	0.4430%	30.21%	7.08%	7.59%	23.13%	22.62%
May-96	2.5800%	-0.2500%	0.5800%	0.6350%	0.6475%	0.6413%	0.6650%	2.0000%	1.9388%	-0.9150%	28.43%	6.96%	7.70%	21.47%	20.73%
Jun-96	0.3800%	4.1600%	0.5400%	0.6425%	0.6558%	0.6492%	0.6720%	-0.1600%	-0.2692%	3.4880%	25.99%	6.48%	7.79%	19.51%	18.20%
Jul-96	-4.4200%	-6.2800%	0.6200%	0.6375%	0.6517%	0.6446%	0.6688%	-5.0400%	-5.0646%	-6.9488%	16.56%	7.44%	7.74%	9.12%	8.82%
Aug-96	2.1100%	2.1300%	0.5700%	0.6217%	0.6358%	0.6288%	0.6532%	1.5400%	1.4813%	1.4768%	18.72%	6.84%	7.55%	11.88%	11.17%
Sep-96	5.6300%	0.9500%	0.6000%	0.6383%	0.6517%	0.6450%	0.6681%	5.0300%	4.9850%	0.2819%	20.32%	7.20%	7.74%	13.12%	12.58%
Oct-96	2.7600%	5.0800%	0.5800%	0.6158%	0.6317%	0.6238%	0.6482%	2.1800%	2.1363%	4.4318%	24.09%	6.96%	7.49%	17.13%	16.61%
Nov-96	7.5600%	2.1100%	0.5200%	0.5917%	0.6092%	0.6004%	0.6253%	7.0400%	6.9596%	1.4847%	27.86%	6.24%	7.21%	21.62%	20.66%
Dec-96	-1.9800%	-0.6000%	0.5600%	0.6000%	0.6175%	0.6088%	0.6309%	-2.5400%	-2.5888%	-1.2309%	22.96%	6.72%	7.31%	16.24%	15.65%
Jan-97	6.2500%	0.6600%	0.5600%	0.6183%	0.6358%	0.6271%	0.6472%	5.6900%	5.6229%	0.0128%	26.35%	6.72%	7.53%	19.63%	18.82%
Feb-97	0.7800%	-0.9500%	0.5100%	0.6092%	0.6283%	0.6188%	0.6369%	0.2700%	0.1613%	-1.5869%	26.16%	6.12%	7.43%	20.04%	18.73%
Mar-97	-4.1100%	-3.0100%	0.5900%	0.6292%	0.6475%	0.6383%	0.6555%	-4.7000%	-4.7483%	-3.6655%	19.82%	7.08%	7.66%	12.74%	12.16%
Apr-97	5.9700%	-1.5000%	0.5900%	0.6442%	0.6608%	0.6525%	0.6697%	5.3800%	5.3175%	-2.1697%	25.14%	7.08%	7.83%	18.06%	17.31%
May-97	6.0900%	4.2300%	0.5800%	0.6317%	0.6500%	0.6408%	0.6575%	5.5100%	5.4492%	3.5725%	29.42%	6.96%	7.69%	22.46%	21.73%
Jun-97	4.4800%	3.1400%	0.5900%	0.6175%	0.6350%	0.6263%	0.6437%	3.8900%	3.8538%	2.4963%	34.70%	7.08%	7.52%	27.62%	27.19%
Jul-97	7.9600%	2.3000%	0.5800%	0.5950%	0.6133%	0.6042%	0.6241%	7.3800%	7.3558%	1.6759%	52.15%	6.96%	7.25%	45.19%	44.90%
Aug-97	-5.6000%	-1.8300%	0.4900%	0.6017%	0.6167%	0.6092%	0.6248%	-6.0900%	-6.2092%	-2.4548%	40.66%	5.88%	7.31%	34.78%	33.35%
Sep-97	5.4800%	4.3300%	0.5800%	0.5950%	0.6117%	0.6033%	0.6229%	4.9000%	4.8767%	3.7071%	40.46%	6.96%	7.24%	33.50%	33.22%
Oct-97	-3.3400%	0.9800%	0.5400%	0.5833%	0.6000%	0.5917%	0.6130%	-3.8800%	-3.9317%	0.3670%	32.12%	6.48%	7.10%	25.64%	25.02%
Nov-97	4.6300%	7.0700%	0.4700%	0.5725%	0.5892%	0.5808%	0.6039%	4.1600%	4.0492%	6.4661%	28.53%	5.64%	6.97%	22.89%	21.56%
Dec-97	1.7200%	7.5200%	0.5400%	0.5633%	0.5825%	0.5729%	0.5970%	1.1800%	1.1471%	6.9230%	33.38%	6.48%	6.88%	26.90%	26.50%
Jan-98	1.1100%	-3.9500%	0.4800%	0.5508%	0.5683%	0.5596%	0.5878%	0.6300%	0.5504%	-4.5378%	26.92%	5.76%	6.72%	21.16%	20.21%
Feb-98	7.2100%	3.4100%	0.4400%	0.5558%	0.5733%	0.5646%	0.5932%	6.7700%	6.6454%	2.8168%	35.02%	5.28%	6.78%	29.74%	28.25%
Mar-98	5.1200%	6.4200%	0.5200%	0.5592%	0.5775%	0.5683%	0.5968%	4.6000%	4.5517%	5.8232%	48.02%	6.24%	6.82%	41.78%	41.20%
Apr-98	1.0100%	-1.9300%	0.4900%	0.5575%	0.5750%	0.5663%	0.5968%	0.5200%	0.4438%	-2.5268%	41.09%	5.88%	6.80%	35.21%	34.30%
May-98	-1.7200%	-0.5000%	0.4800%	0.5575%	0.5758%	0.5667%	0.5969%	-2.2000%	-2.2867%	-1.0969%	30.70%	5.76%	6.80%	24.94%	23.90%
Jun-98	4.0600%	3.6900%	0.5200%	0.5442%	0.5650%	0.5546%	0.5864%	3.5400%	3.5054%	3.1036%	30.18%	6.24%	6.66%	23.94%	23.52%
Jul-98	-1.0600%	-4.9300%	0.4900%	0.5458%	0.5650%	0.5554%	0.5853%	-1.5500%	-1.6154%	-5.5153%	19.30%	5.88%	6.67%	13.42%	12.64%
Aug-98	-14.4600%	1.6100%	0.4800%	0.5433%	0.5642%	0.5538%	0.5835%	-14.9400%	-15.0138%	1.0265%	8.11%	5.76%	6.65%	2.35%	1.46%
Sep-98	6.4100%	8.3500%	0.4400%	0.5333%	0.5567%	0.5450%	0.5780%	5.9700%	5.8650%	7.7720%	9.06%	5.28%	6.54%	3.78%	2.52%
Oct-98	8.1300%	-1.6600%	0.4200%	0.5308%	0.5583%	0.5446%	0.5796%	7.7100%	7.5854%	-2.2396%	22.00%	5.04%	6.54%	16.96%	15.47%
Nov-98	6.0600%	1.3400%	0.4500%	0.5342%	0.5658%	0.5500%	0.5864%	5.6100%	5.5100%	0.7536%	23.67%	5.40%	6.60%	18.27%	17.07%
Dec-98	5.7600%	2.9500%	0.4500%	0.5183%	0.5542%	0.5363%	0.5757%	5.3100%	5.2238%	2.3743%	28.58%	5.40%	6.44%	23.18%	22.14%
Jan-99	4.1800%	-4.5100%	0.4200%	0.5200%	0.5567%	0.5383%	0.5808%	3.7600%	3.6417%	-5.0908%	32.48%	5.04%	6.46%	27.44%	26.02%
Feb-99	-3.1100%	-3.6400%	0.4000%	0.5333%	0.5658%	0.5496%	0.5897%	-3.5100%	-3.6596%	-4.2297%	19.73%	4.80%	6.60%	14.93%	13.14%
Mar-99	4.0000%	-1.4800%	0.5300%	0.5517%	0.5817%	0.5667%	0.6046%	3.4700%	3.4333%	-2.0846%	18.45%	6.36%	6.80%	12.09%	11.65%
Apr-99	3.8700%	8.8400%	0.4800%	0.5533%	0.5800%	0.5667%	0.6012%	3.3900%	3.3033%	8.2388%	21.81%	5.76%	6.80%	16.05%	15.01%
May-99	-2.3600%	6.0900%	0.4500%	0.5775%	0.6025%	0.5900%	0.6214%	-2.8100%	-2.9500%	5.4686%	21.02%	5.40%	7.08%	15.62%	13.94%
Jun-99	5.5500%	-3.3200%	0.5500%	0.6025%	0.6267%	0.6146%	0.6445%	5.0000%	4.9354%	-3.9645%	22.75%	6.60%	7.38%	16.15%	15.37%
Jul-99	-3.1200%	-1.1400%	0.5100%	0.5992%	0.6233%	0.6113%	0.6418%	-3.6300%	-3.7313%	-1.7818%	20.19%	6.12%	7.34%	14.07%	12.86%
Aug-99	-0.4900%	1.1700%	0.5400%	0.6167%	0.6400%	0.6283%	0.6589%	-1.0300%	-1.1183%	0.5111%	39.82%	6.48%	7.54%	33.34%	32.28%
Sep-99	-2.7400%	-4.8000%	0.5200%	0.6158%	0.6400%	0.6279%	0.6610%	-3.2600%	-3.3679%	-5.4610%	27.80%	6.24%	7.54%	21.56%	20.26%
Oct-99	6.3300%	1.5700%	0.5000%	0.6292%	0.6492%	0.6392%	0.6721%	5.8300%	5.6908%	0.8979%	25.67%	6.00%	7.67%	19.67%	18.00%
Nov-99	2.0300%	-7.7300%	0.5600%	0.6133%	0.6350%	0.6242%	0.6610%	1.4700%	1.4058%	-8.3910%	20.90%	6.72%	7.49%	14.18%	13.41%
Dec-99	5.8900%	0.9300%	0.5500%	0.6292%	0.6483%	0.6388%	0.6766%	5.3400%	5.2513%	0.2534%	21.04%	6.60%	7.67%	14.44%	13.38%

	Market Return	S&P Return	Ibbot LT RF	Aaa Corp	Aa Corp	Avg Aaa and Aa Corp	A PU	RPMKT	RPAAAAA	RPSPA	Mkt Annlized Return	RF Annualized Yield	AAAAA Annualized Yield	MRP RP	AAAAA RP
Jan-00	-5.0200%	10.8500%	0.5700%	0.6483%	0.6633%	0.6558%	0.6956%	-5.5900%	-5.6758%	10.1544%	10.36%	6.84%	7.87%	3.52%	2.49%
Feb-00	-1.8900%	-5.7800%	0.5100%	0.6400%	0.6517%	0.6458%	0.6874%	-2.4000%	-2.5358%	-6.4674%	11.75%	6.12%	7.75%	5.63%	4.00%
Mar-00	9.7800%	3.4900%	0.5400%	0.6400%	0.6525%	0.6463%	0.6906%	9.2400%	9.1338%	2.7994%	17.96%	6.48%	7.76%	11.48%	10.20%
Apr-00	-3.0100%	7.9400%	0.4700%	0.6367%	0.6517%	0.6442%	0.6898%	-3.4800%	-3.6542%	7.2502%	10.14%	5.64%	7.73%	4.50%	2.41%
May-00	-2.0500%	4.8600%	0.5600%	0.6658%	0.6867%	0.6763%	0.7244%	-2.6100%	-2.7263%	4.1356%	10.49%	6.72%	8.12%	3.77%	2.38%
Jun-00	2.4700%	-5.7500%	0.5200%	0.6392%	0.6558%	0.6475%	0.6980%	1.9500%	1.8225%	-6.4480%	7.27%	6.24%	7.77%	1.03%	-0.50%
Jul-00	-1.5600%	6.7700%	0.5200%	0.6375%	0.6508%	0.6442%	0.6882%	-2.0800%	-2.2042%	6.0818%	9.00%	6.24%	7.73%	2.76%	1.27%
Aug-00	6.2100%	13.7200%	0.5000%	0.6292%	0.6417%	0.6354%	0.6774%	5.7100%	5.5746%	13.0426%	16.33%	6.00%	7.63%	10.33%	8.71%
Sep-00	-5.2800%	9.1500%	0.4600%	0.6350%	0.6525%	0.6438%	0.6853%	-5.7400%	-5.9238%	8.4647%	13.30%	5.52%	7.73%	7.78%	5.57%
Oct-00	-0.4200%	-3.5700%	0.5300%	0.6292%	0.6508%	0.6400%	0.6787%	-0.9500%	-1.0600%	-4.2487%	6.10%	6.36%	7.68%	-0.26%	-1.58%
Nov-00	-7.8800%	-1.3200%	0.4800%	0.6208%	0.6458%	0.6333%	0.6772%	-8.3600%	-8.5133%	-1.9972%	-4.20%	5.76%	7.60%	-9.96%	-11.80%
Dec-00	0.4900%	9.8200%	0.4500%	0.6008%	0.6233%	0.6121%	0.6547%	0.0400%	-0.1221%	9.1654%	-9.09%	5.40%	7.35%	-14.49%	-16.43%
Jan-01	3.5500%	-9.6700%	0.4900%	0.5958%	0.6150%	0.6054%	0.6499%	3.0600%	2.9446%	-10.3199%	-0.88%	5.88%	7.27%	-6.76%	-8.15%
Feb-01	-9.1200%	3.5300%	0.4200%	0.5917%	0.6100%	0.6008%	0.6449%	-9.5400%	-9.7208%	2.8851%	-8.19%	5.04%	7.21%	-13.23%	-15.40%
Mar-01	-6.3400%	-0.6300%	0.4500%	0.5817%	0.6017%	0.5917%	0.6394%	-6.7900%	-6.9317%	-1.2694%	-21.67%	5.40%	7.10%	-27.07%	-28.77%
Apr-01	7.7700%	6.0500%	0.4700%	0.6000%	0.6192%	0.6096%	0.6603%	7.3000%	7.1604%	5.3897%	-12.96%	5.64%	7.32%	-18.60%	-20.28%
May-01	0.6700%	-3.4300%	0.5000%	0.6075%	0.6250%	0.6163%	0.6663%	0.1700%	0.0538%	-4.0963%	-10.55%	6.00%	7.40%	-16.55%	-17.94%
Jun-01	-2.4300%	-7.9100%	0.4700%	0.5983%	0.6117%	0.6050%	0.6546%	-2.9000%	-3.0350%	-8.5646%	-14.82%	5.64%	7.26%	-20.46%	-22.08%
Jul-01	-0.9800%	-4.4800%	0.5200%	0.5942%	0.6058%	0.6000%	0.6494%	-1.5000%	-1.5800%	-5.1294%	-14.32%	6.24%	7.20%	-20.56%	-21.52%
Aug-01	-6.2600%	-2.9000%	0.4600%	0.6000%	0.5925%	0.5963%	0.6329%	-6.7200%	-6.8563%	-3.5329%	-24.38%	5.52%	7.16%	-29.90%	-31.54%
Sep-01	-8.0800%	-11.5200%	0.4100%	0.5975%	0.6058%	0.6017%	0.6423%	-8.4900%	-8.6817%	-12.1623%	-26.62%	4.92%	7.22%	-31.54%	-33.84%
Oct-01	1.9100%	-0.1700%	0.4800%	0.5858%	0.5942%	0.5900%	0.6373%	1.4300%	1.3200%	-0.8073%	-24.90%	5.76%	7.08%	-30.66%	-31.98%
Nov-01	7.6700%	-5.5200%	0.4100%	0.5808%	0.5842%	0.5825%	0.6287%	7.2600%	7.0875%	-6.1487%	-12.22%	4.92%	6.99%	-17.14%	-19.21%
Dec-01	0.8800%	2.6000%	0.4600%	0.5633%	0.5992%	0.5813%	0.6526%	0.4200%	0.2988%	1.9474%	-11.88%	5.52%	6.98%	-17.40%	-18.86%
Jan-02	-1.4600%	-5.6500%	0.4800%	0.5458%	0.5858%	0.5658%	0.6387%	-1.9400%	-2.0258%	-6.2887%	-16.15%	5.76%	6.79%	-21.91%	-22.94%
Feb-02	-1.9300%	-2.3500%	0.4300%	0.5425%	0.5792%	0.5608%	0.6283%	-2.3600%	-2.4908%	-2.9783%	-9.51%	5.16%	6.73%	-14.67%	-16.24%
Mar-02	3.7600%	12.2300%	0.4300%	0.5675%	0.6017%	0.5846%	0.6453%	3.3300%	3.1754%	11.5847%	0.25%	5.16%	7.02%	-4.91%	-6.77%
Apr-02	-6.0600%	-1.7100%	0.5400%	0.5633%	0.5967%	0.5800%	0.6316%	-6.6000%	-6.6400%	-2.3416%	-12.62%	6.48%	6.96%	-19.10%	-19.58%
May-02	-0.7400%	-9.0200%	0.4900%	0.5625%	0.6000%	0.5813%	0.6272%	-1.2300%	-1.3213%	-9.6472%	-13.84%	5.88%	6.98%	-19.72%	-20.82%
Jun-02	-7.1200%	-7.1000%	0.4400%	0.5533%	0.5900%	0.5717%	0.6180%	-7.5600%	-7.6917%	-7.7180%	-17.98%	5.28%	6.86%	-23.26%	-24.84%
Jul-02	-7.8000%	-13.8000%	0.5100%	0.5442%	0.5817%	0.5629%	0.6101%	-8.3100%	-8.3629%	-14.4101%	-23.63%	6.12%	6.76%	-29.75%	-30.39%
Aug-02	0.6600%	3.5000%	0.4400%	0.5308%	0.5700%	0.5504%	0.5979%	0.2200%	0.1096%	2.9021%	-18.00%	5.28%	6.61%	-23.28%	-24.60%
Sep-02	-10.8700%	-12.8300%	0.4200%	0.5125%	0.5525%	0.5325%	0.5906%	-11.2900%	-11.4025%	-13.4206%	-20.48%	5.04%	6.39%	-25.52%	-26.87%
Oct-02	8.8000%	-1.7300%	0.4000%	0.5275%	0.5617%	0.5446%	0.6016%	8.4000%	8.2554%	-2.3316%	-15.11%	4.80%	6.54%	-19.91%	-21.64%
Nov-02	5.8900%	2.4900%	0.4000%	0.5258%	0.5592%	0.5425%	0.5952%	5.4900%	5.3475%	1.8948%	-16.51%	4.80%	6.51%	-21.31%	-23.02%
Dec-02	-5.8700%	4.1600%	0.4500%	0.5175%	0.5525%	0.5350%	0.5896%	-6.3200%	-6.4050%	3.5704%	-22.10%	5.40%	6.42%	-27.50%	-28.52%
Jan-03	-2.6200%	-2.9200%	0.4100%	0.5142%	0.5492%	0.5317%	0.5887%	-3.0300%	-3.1517%	-3.5087%	-23.01%	4.92%	6.38%	-27.93%	-29.39%
Feb-03	-1.5000%	-4.9000%	0.3800%	0.4958%	0.5283%	0.5121%	0.5778%	-1.8800%	-2.0121%	-5.4778%	-22.68%	4.56%	6.15%	-27.24%	-28.82%
Mar-03	0.9700%	5.0500%	0.4000%	0.4908%	0.5233%	0.5071%	0.5663%	0.5700%	0.4629%	4.4837%	-24.76%	4.80%	6.09%	-29.56%	-30.84%
Apr-03	8.2400%	8.8500%	0.4000%	0.4783%	0.5183%	0.4983%	0.5540%	7.8400%	7.7417%	8.2960%	-13.30%	4.80%	5.98%	-18.10%	-19.28%
May-03	5.2700%	10.2100%	0.3900%	0.4350%	0.4875%	0.4613%	0.5310%	4.8800%	4.8088%	9.6790%	-8.05%	4.68%	5.54%	-12.73%	-13.59%
Jun-03	1.2800%	1.1900%	0.3600%	0.4142%	0.4767%	0.4454%	0.5173%	0.9200%	0.8346%	0.6727%	0.26%	4.32%	5.35%	-4.06%	-5.08%
Jul-03	1.7600%	-6.5000%	0.3800%	0.4575%	0.5058%	0.4817%	0.5457%	1.3800%	1.2783%	-7.0457%	10.66%	4.56%	5.78%	6.10%	4.88%
Aug-03	1.9500%	1.7500%	0.4200%	0.4892%	0.5258%	0.5075%	0.5659%	1.5300%	1.4425%	1.1841%	12.08%	5.04%	6.09%	7.04%	5.99%
Sep-03	-1.0600%	4.5700%	0.4600%	0.4767%	0.5108%	0.4938%	0.5487%	-1.5200%	-1.5538%	4.0213%	24.41%	5.52%	5.93%	18.89%	18.49%
Oct-03	5.6600%	1.1200%	0.4100%	0.4750%	0.5092%	0.4921%	0.5350%	5.2500%	5.1679%	0.5850%	20.82%	4.92%	5.91%	15.90%	14.92%
Nov-03	0.8800%	-0.0500%	0.3900%	0.4708%	0.5067%	0.4888%	0.5309%	0.4900%	0.3913%	-0.5809%	15.11%	4.68%	5.87%	10.43%	9.24%
Dec-03	5.2400%	6.7500%	0.4700%	0.4708%	0.5017%	0.4863%	0.5233%	4.7700%	4.7538%	6.2268%	28.69%	5.64%	5.84%	23.05%	22.86%
Jan-04	1.8400%	2.1600%	0.4200%	0.4617%	0.4925%	0.4771%	0.5128%	1.4200%	1.3629%	1.6472%	34.58%	5.04%	5.73%	29.54%	28.86%
Feb-04	1.3900%	1.8100%	0.3800%	0.4583%	0.4892%	0.4738%	0.5125%	1.0100%	0.9163%	1.2975%	38.53%	4.56%	5.69%	33.97%	32.85%
Mar-04	-1.5100%	1.0400%	0.4300%	0.4442%	0.4750%	0.4596%	0.4975%	-1.9400%	-1.9696%	0.5425%	35.13%	5.16%	5.52%	29.97%	29.62%
Apr-04	-1.5700%	-3.6200%	0.3900%	0.4775%	0.5083%	0.4929%	0.5271%	-1.9600%	-2.0629%	-4.1471%	22.88%	4.68%	5.92%	18.20%	16.97%
May-04	1.3700%	0.7900%	0.4000%	0.5033%	0.5333%	0.5183%	0.5517%	0.9700%	0.8517%	0.2383%	18.33%	4.80%	6.22%	13.53%	12.11%
Jun-04	1.9400%	1.5500%	0.4800%	0.5008%	0.5175%	0.5092%	0.5388%	1.4600%	1.4308%	1.0112%	19.10%	5.76%	6.11%	13.34%	12.99%
Jul-04	-3.3100%	1.7300%	0.4300%	0.4850%	0.5017%	0.4933%	0.5227%	-3.7400%	-3.8033%	1.2073%	13.17%	5.16%	5.92%	8.01%	7.25%
Aug-04	0.4000%	3.9300%	0.4500%	0.4708%	0.4892%	0.4800%	0.5124%	-0.0500%	-0.0800%	3.4177%	11.45%	5.40%	5.76%	6.05%	5.69%
Sep-04	1.0800%	0.9100%	0.4000%	0.4550%	0.4775%	0.4663%	0.4985%	0.6800%	0.6138%	0.4115%	13.86%	4.80%	5.60%	9.06%	8.26%
Oct-04	1.5300%	4.9500%	0.3800%	0.4558%	0.4742%	0.4650%	0.4992%	1.1500%	1.0650%	4.4508%	9.41%	4.56%	5.58%	4.85%	3.83%
Nov-04	4.0500%	4.0700%	0.4100%	0.4600%	0.4767%	0.4683%	0.4963%	3.6400%	3.5817%	3.5737%	12.85%	4.92%	5.62%	7.93%	7.23%
Dec-04	3.4000%	2.6500%	0.4300%	0.4558%	0.4742%	0.4650%	0.4939%	2.9700%	2.9350%	2.1561%	10.87%	5.16%	5.58%	5.71%	5.29%
Jan-05	-2.4400%	2.2100%	0.4100%	0.4467%	0.4650%	0.4558%	0.4828%	-2.8500%	-2.8958%	1.7272%	6.21%	4.92%	5.47%	1.29%	0.74%
Feb-05	2.1000%	1.9700%	0.3500%	0.4333%	0.4533%	0.4433%	0.4679%	1.7500%	1.6567%	1.5022%	6.96%	4.20%	5.32%	2.76%	1.64%
Mar-05	-1.7700%	1.0800%	0.4100%	0.4500%	0.4700%	0.4600%	0.4855%	-2.1800%	-2.2300%	0.5945%	6.67%	4.92%	5.52%	1.75%	1.15%
Apr-05	-1.9000%	3.2100%	0.3900%	0.4442%	0.4533%	0.4488%	0.4708%	-2.2900%	-2.3488%	2.7392%	6.32%	4.68%	5.39%	1.64%	0.93%
May-05	3.1800%	0.0800%	0.4000%	0.4292%	0.4408%	0.4350%	0.4616%	2.7800%	2.7450%	-0.3816%	8.22%	4.80%	5.22%	3.42%	3.00%
Jun-05	0.1400%	5.7600%	0.3600%	0.4133%	0.4183%	0.4158%	0.4502%	-0.2200%	-0.2758%	5.3098%	6.30%	4.32%	4.99%	1.98%	1.31%
Jul-05	3.7200%	2.3300%	0.3400%	0.4217%	0.4283%	0.4250%	0.4583%	3.3800%	3.2950%	1.8717%	14.03%	4.08%	5.10%	9.95%	8.93%
Aug-05	-0.9100%	0.7300%	0.4000%	0.4242%	0.4333%	0.4288%	0.4591%	-1.3100%	-1.3388%	0.2709%	12.55%	4.80%	5.15%	7.75%	7.40%
Sep-05	0.8100%	4.0200%	0.3500%	0.4275%	0.4367%	0.4321%	0.4585%	0.4600%	0.3779%	3.5615%	12.24%	4.20%	5.19%	8.04%	7.06%
Oct-05	-1.6700%	-6.1700%	0.3900%	0.4450%	0.4550%	0.4500%	0.4812%	-2.0600%	-2.1200%	-6.6512%	8.71%	4.68%	5.40%	4.03%	3.31%
Nov-05	3.7800%	-0.3900%	0.3900%	0.4521%	0.4625%	0.4573%	0.4899%	3.3900%	3.3227%	-0.8799%	8.43%	4.68%	5.49%	3.75%	2.94%
Dec-05	0.0300%	1.1000%	0.3900%	0.4483%	0.4592%	0.4538%	0.4848%	-0.3600%	-0.4238%	0.6152%	4.89%	4.68%	5.45%	0.21%	-0.55%
Jan-06	2.6500%	2.6348%	0.4000%	0.4408%	0.4542%	0.4475%	0.4792%	2.2500%	2.2025%	2.1556%	10.36%	4.80%	5.37%	5.56%	4.99%
Feb-06	0.2700%	0.9527%	0.3600%	0.4458%	0.4592%	0.4525%	0.4850%	-0.0900%	-0.1825%	0.4677%	8.39%	4.32%	5.43%	4.07%	2.96%
Mar-06	1.2400%	-4.6345%	0.3900%	0.4600%	0.4725%	0.4663%	0.4983%	0.8500%	0.7738%	-5.1328%	11.71%	4.68%	5.60%	7.03%	6.11%
Apr-06	1.3400%	1.7167%	0.3900%	0.4867%	0.5000%	0.4933%	0.5242%	0.9500%	0.8467%	1.1925%	15.40%	4.68%	5.92%	10.72%	9.48%
May-06	-2.8800%	1.4281%	0.4800%	0.4958%	0.5108%	0.5033%	0.5350%	-3.3600%	-3.3833%	0.8931%	8.62%	5.76%	6.04%	2.86%	2.58%
Jun-06	0.1400%	2.4158%	0.4400%	0.4908%	0.5092%	0.5000%	0.5333%	-0.3000%	-0.3600%	1.8825%	8.62%	5.28%	6.00%	3.34%	2.62%
Jul-06	0.6200%	5.1109%	0.4500%	0.4875%	0.5067%	0.4971%	0.5308%	0.1700%	0.1229%	4.5801%	5.37%	5.40%	5.97%	-0.03%	-0.59%
Aug-06	2.3800%	2.7122%	0.4300%	0.4733%	0.4925%	0.4829%	0.5167%	1.9500%	1.8971%	2.1955%	8.87%	5.16%	5.80%	3.71%	3.08%
Sep-06	2.5800%	-1.7362%	0.3900%	0.4592%	0.4792%	0.4692%	0.5000%	2.1900%	2.1108%	-2.2362%	10.78%	4.68%	5.63%	6.10%	5.15%

	Market Return	S&P Return	Ibbot LT RF	Aaa Corp	Aa Corp	Avg Aaa and Aa Corp	A PU	RPMKT	RPAAAAA	RPSPA	Mkt Annlized Return	RF Annualized Yield	AAAAA Annualized Yield	MRP RP	AAAAA RP
Oct-06	3.2600%	5.6026%	0.4200%	0.4592%	0.4783%	0.4688%	0.4983%	2.8400%	2.7913%	5.1043%	16.34%	5.04%	5.63%	11.30%	10.71%
Nov-06	1.9000%	2.1405%	0.3900%	0.4442%	0.4642%	0.4542%	0.4833%	1.5100%	1.4458%	1.6572%	14.23%	4.68%	5.45%	9.55%	8.78%
Dec-06	1.4000%	1.1817%	0.3600%	0.4408%	0.4650%	0.4529%	0.4842%	1.0400%	0.9471%	0.6975%	15.79%	4.32%	5.44%	11.47%	10.36%
Jan-07	1.5100%	-0.1134%	0.4300%	0.4500%	0.4792%	0.4646%	0.4967%	1.0800%	1.0454%	-0.6101%	14.51%	5.16%	5.58%	9.35%	8.93%
Feb-07	-1.9600%	5.0341%	0.3800%	0.4492%	0.4767%	0.4629%	0.4917%	-2.3400%	-2.4229%	4.5424%	11.96%	4.56%	5.56%	7.40%	6.41%
Mar-07	1.1200%	4.1373%	0.3900%	0.4417%	0.4717%	0.4567%	0.4875%	0.7300%	0.6633%	3.6498%	11.83%	4.68%	5.48%	7.15%	6.35%
Apr-07	4.4300%	4.3759%	0.4200%	0.4558%	0.4858%	0.4708%	0.4975%	4.0100%	3.9592%	3.8784%	15.24%	5.04%	5.65%	10.20%	9.59%
May-07	3.4900%	0.5145%	0.4100%	0.4558%	0.4875%	0.4717%	0.4992%	3.0800%	3.0183%	0.0153%	22.80%	4.92%	5.66%	17.88%	17.14%
Jun-07	-1.6600%	-5.0621%	0.4000%	0.0483%	0.5142%	0.2812%	0.5250%	-2.0600%	-1.9412%	-5.5871%	20.59%	4.80%	3.37%	15.79%	17.21%
Jul-07	-3.1000%	-3.5666%	0.4600%	0.4775%	0.5075%	0.4925%	0.5208%	-3.5600%	-3.5925%	-4.0874%	16.13%	5.52%	5.91%	10.61%	10.22%
Aug-07	1.5000%	2.0956%	0.4200%	0.4825%	0.5050%	0.4938%	0.5200%	1.0800%	1.0063%	1.5756%	15.13%	5.04%	5.93%	10.09%	9.21%
Sep-07	3.7400%	3.5427%	0.3700%	0.4783%	0.5017%	0.4900%	0.5150%	3.3700%	3.2500%	3.0277%	16.43%	4.44%	5.88%	11.99%	10.55%
Oct-07	1.5900%	6.8641%	0.4300%	0.4717%	0.4950%	0.4833%	0.5092%	1.1600%	1.1067%	6.3549%	14.55%	5.16%	5.80%	9.39%	8.75%
Nov-07	-4.1800%	0.3405%	0.3900%	0.4533%	0.4817%	0.4675%	0.4975%	-4.5700%	-4.6475%	-0.1570%	7.72%	4.68%	5.61%	3.04%	2.11%
Dec-07	-0.6900%	0.2754%	0.3700%	0.4575%	0.4925%	0.4750%	0.5133%	-1.0600%	-1.1650%	-0.2379%	5.50%	4.44%	5.70%	1.06%	-0.20%
Jan-08	-6.0000%	-6.8133%	0.4000%	0.4442%	0.4817%	0.4629%	0.5017%	-6.4000%	-6.4629%	-7.3150%	-2.31%	4.80%	5.56%	-7.11%	-7.86%
Feb-08	-3.2500%	-4.9956%	0.3400%	0.4608%	0.4975%	0.4792%	0.5175%	-3.5900%	-3.7292%	-5.5131%	-3.59%	4.08%	5.75%	-7.67%	-9.34%
Mar-08	-0.4300%	1.7056%	0.3700%	0.4592%	0.4917%	0.4754%	0.5175%	-0.8000%	-0.9054%	1.1881%	-5.07%	4.44%	5.71%	-9.51%	-10.78%
Apr-08	4.8700%	5.5163%	0.3500%	0.4625%	0.4942%	0.4783%	0.5242%	4.5200%	4.3917%	4.9921%	-4.67%	4.20%	5.74%	-8.87%	-10.41%
May-08	1.3000%	3.1987%	0.3700%	0.4642%	0.5000%	0.4821%	0.5225%	0.9300%	0.8179%	2.6762%	-6.69%	4.44%	5.79%	-11.13%	-12.47%
Jun-08	-8.4300%	-0.8668%	0.4000%	0.4733%	0.5092%	0.4913%	0.5317%	-8.8300%	-8.9213%	-1.3985%	-13.11%	4.80%	5.90%	-17.91%	-19.01%
Jul-08	-0.8400%	-6.1108%	0.3900%	0.4725%	0.5042%	0.4883%	0.5333%	-1.2300%	-1.3283%	-6.6441%	-11.09%	4.68%	5.86%	-15.77%	-16.95%
Aug-08	1.4500%	-1.6602%	0.3600%	0.4700%	0.5008%	0.4854%	0.5308%	1.0900%	0.9646%	-2.1910%	-11.13%	4.32%	5.83%	-15.45%	-16.95%
Sep-08	-8.9100%	-11.4823%	0.3900%	0.4708%	0.5025%	0.4867%	0.5408%	-9.3000%	-9.3967%	-12.0231%	-21.97%	4.68%	5.84%	-26.65%	-27.81%
Oct-08	-16.7900%	-11.6128%	0.3700%	0.5233%	0.5658%	0.5446%	0.6300%	-17.1600%	-17.3346%	-12.2428%	-36.08%	4.44%	6.54%	-40.52%	-42.62%
Nov-08	-7.1800%	2.7894%	0.3600%	0.5100%	0.5608%	0.5354%	0.6333%	-7.5400%	-7.7154%	2.1561%	-38.09%	4.32%	6.43%	-42.41%	-44.51%
Dec-08	1.0600%	-1.6797%	0.3300%	0.4217%	0.4842%	0.4529%	0.5450%	0.7300%	0.6071%	-2.2247%	-36.99%	3.96%	5.44%	-40.95%	-42.43%
Jan-09	-8.4300%	-0.4541%	0.2400%	0.4208%	0.4867%	0.4538%	0.5325%	-8.6700%	-8.8838%	-0.9866%	-38.62%	2.88%	5.45%	-41.50%	-44.07%
Feb-09	-10.6500%	-12.5708%	0.3000%	0.4392%	0.5017%	0.4704%	0.5250%	-10.9500%	-11.1204%	-13.0958%	-43.32%	3.60%	5.65%	-46.92%	-48.96%
Mar-09	8.7600%	2.5255%	0.3500%	0.4583%	0.5092%	0.4838%	0.5350%	8.4100%	8.2763%	1.9905%	-38.09%	4.20%	5.81%	-42.29%	-43.89%
Apr-09	9.5700%	0.8462%	0.2900%	0.4492%	0.5142%	0.4817%	0.5400%	9.2800%	9.0883%	0.3062%	-35.31%	3.48%	5.78%	-38.79%	-41.09%
May-09	5.5900%	3.5287%	0.3300%	0.4617%	0.5200%	0.4908%	0.5408%	5.2600%	5.0992%	2.9879%	-32.57%	3.96%	5.89%	-36.53%	-38.46%
Jun-09	0.2000%	5.5202%	0.3800%	0.4675%	0.5100%	0.4888%	0.5167%	-0.1800%	-0.2888%	5.0035%	-26.22%	4.56%	5.87%	-30.78%	-32.08%
Jul-09	7.5600%	4.0755%	0.3600%	0.4508%	0.4758%	0.4633%	0.4975%	7.2000%	7.0967%	3.5780%	-19.97%	4.32%	5.56%	-24.29%	-25.53%
Aug-09	3.6100%	0.5460%	0.3600%	0.4383%	0.4542%	0.4463%	0.4758%	3.2500%	3.1638%	0.0702%	-18.26%	4.32%	5.36%	-22.58%	-23.62%
Sep-09	3.7300%	1.4284%	0.3400%	0.4275%	0.4342%	0.4308%	0.4608%	3.3900%	3.2992%	0.9676%	-6.92%	4.08%	5.17%	-11.00%	-12.09%
Oct-09	-1.8600%	-2.8427%	0.3300%	0.4292%	0.4367%	0.4329%	0.4625%	-2.1900%	-2.2929%	-3.3052%	9.78%	3.96%	5.20%	5.82%	4.58%
Nov-09	6.0000%	4.5586%	0.3500%	0.4325%	0.4408%	0.4367%	0.4700%	5.6500%	5.5633%	4.0886%	25.37%	4.20%	5.24%	21.17%	20.13%
Dec-09	1.9300%	5.5813%	0.3400%	0.4383%	0.4533%	0.4458%	0.4825%	1.5900%	1.4842%	5.0988%	26.45%	4.08%	5.35%	22.37%	21.10%
Jan-10	-3.6000%	-4.7493%	0.3600%	0.4383%	0.4583%	0.4483%	0.4808%	-3.9600%	-4.0483%	-5.2301%	33.12%	4.32%	5.38%	28.80%	27.74%
Feb-10	3.1000%	-1.4896%	0.3300%	0.4458%	0.4683%	0.4571%	0.4892%	2.7700%	2.6429%	-1.9788%	53.60%	3.96%	5.49%	49.64%	48.12%
Mar-10	6.0300%	2.7978%	0.4000%	0.4392%	0.4642%	0.4517%	0.4867%	5.6300%	5.5783%	2.3111%	49.75%	4.80%	5.42%	44.95%	44.33%
Apr-10	1.5800%	2.8058%	0.3800%	0.4408%	0.4642%	0.4525%	0.4842%	1.2000%	1.1275%	2.3216%	38.83%	4.56%	5.43%	34.27%	33.40%
May-10	-7.9900%	-5.7600%	0.3400%	0.4133%	0.4375%	0.4254%	0.4583%	-8.3300%	-8.4154%	-6.2183%	20.97%	4.08%	5.11%	16.89%	15.87%
Jun-10	-5.2300%	-0.6360%	0.3700%	0.4067%	0.4300%	0.4183%	0.4550%	-5.6000%	-5.6483%	-1.0910%	14.42%	4.44%	5.02%	9.98%	9.40%
Jul-10	7.0100%	7.7413%	0.3100%	0.3933%	0.4133%	0.4033%	0.4383%	6.7000%	6.6067%	7.3030%	13.83%	3.72%	4.84%	10.11%	8.99%
Aug-10	-4.5100%	1.2496%	0.3200%	0.3742%	0.3933%	0.3838%	0.4175%	-4.8300%	-4.8938%	0.8321%	4.91%	3.84%	4.61%	1.07%	0.31%
Sep-10	8.9200%	2.9575%	0.2600%	0.3775%	0.3933%	0.3854%	0.4175%	8.6600%	8.5346%	2.5400%	10.16%	3.12%	4.63%	7.04%	5.53%
Oct-10	3.8000%	1.2869%	0.2700%	0.3900%	0.4025%	0.3963%	0.4250%	3.5300%	3.4038%	0.8619%	16.51%	3.24%	4.76%	13.27%	11.76%
Nov-10	0.0100%	-3.2323%	0.3200%	0.4058%	0.4225%	0.4142%	0.4475%	-0.3100%	-0.4042%	-3.6798%	9.93%	3.84%	4.97%	6.09%	4.96%
Dec-10	6.6800%	3.1151%	0.3200%	0.4183%	0.4383%	0.4283%	0.4633%	6.3600%	6.2517%	2.6518%	15.05%	3.84%	5.14%	11.21%	9.91%
Jan-11	2.3700%	1.4241%	0.3500%	0.4200%	0.4383%	0.4292%	0.4642%	2.0200%	1.9408%	0.9599%	22.18%	4.20%	5.15%	17.98%	17.03%
Feb-11	3.4300%	1.1235%	0.3200%	0.4350%	0.4475%	0.4413%	0.4733%	3.1100%	2.9888%	0.6502%	22.57%	3.84%	5.30%	18.73%	17.27%
Mar-11	0.0400%	0.1474%	0.3600%	0.4275%	0.4400%	0.4338%	0.4633%	-0.3200%	-0.3938%	-0.3159%	15.64%	4.32%	5.21%	11.32%	10.44%
Apr-11	2.9600%	4.1878%	0.3400%	0.4300%	0.4408%	0.4354%	0.4625%	2.6200%	2.5246%	3.7253%	17.21%	4.08%	5.23%	13.13%	11.99%
May-11	-1.1300%	1.9754%	0.3600%	0.4133%	0.4217%	0.4175%	0.4433%	-1.4900%	-1.5475%	1.5321%	25.95%	4.32%	5.01%	21.63%	20.94%
Jun-11	-1.6700%	-0.1283%	0.3200%	0.4158%	0.4200%	0.4179%	0.4383%	-1.9900%	-2.0879%	-0.5666%	30.68%	3.84%	5.02%	26.84%	25.67%
Jul-11	-2.0300%	-0.7538%	0.3200%	0.4108%	0.4192%	0.4150%	0.4392%	-2.3500%	-2.4450%	-1.1930%	19.64%	3.84%	4.98%	15.80%	14.66%
Aug-11	-5.4300%	2.0388%	0.3400%	0.3642%	0.3725%	0.3683%	0.3908%	-5.7700%	-5.7983%	1.6480%	18.49%	4.08%	4.42%	14.41%	14.07%
Sep-11	-7.0300%	0.2271%	0.2600%	0.3408%	0.3525%	0.3467%	0.3733%	-7.2900%	-7.3767%	-0.1462%	1.14%	3.12%	4.16%	-1.98%	-3.02%
Oct-11	10.9300%	3.8747%	0.2200%	0.3317%	0.3467%	0.3392%	0.3767%	10.7100%	10.5908%	3.4980%	8.09%	2.64%	4.07%	5.45%	4.02%
Nov-11	-0.2200%	0.8014%	0.2400%	0.3225%	0.3308%	0.3267%	0.3542%	-0.4600%	-0.5467%	0.4472%	7.84%	2.88%	3.92%	4.96%	3.92%
Dec-11	1.0200%	3.3767%	0.2200%	0.3275%	0.3358%	0.3317%	0.3608%	0.8000%	0.6883%	3.0159%	2.12%	2.64%	3.98%	-0.52%	-1.86%
Jan-12	4.4800%	-3.3237%	0.2100%	0.3342%	0.3342%	0.3342%	0.3617%	4.2700%	4.1458%	-3.6854%	4.22%	2.52%	4.01%	1.70%	0.21%
Feb-12	4.3200%	0.3451%	0.2000%	0.3325%	0.3325%	0.3325%	0.3633%	4.1200%	3.9875%	-0.0182%	5.12%	2.40%	3.99%	2.72%	1.13%
Mar-12	3.2900%	1.3720%	0.2200%	0.3325%	0.3450%	0.3388%	0.3733%	3.0700%	2.9513%	0.9987%	8.53%	2.64%	4.07%	5.89%	4.47%
Apr-12	-0.6300%	2.1237%	0.2500%	0.3300%	0.3400%	0.3350%	0.3667%	-0.8800%	-0.9650%	1.7570%	4.75%	3.00%	4.02%	1.75%	0.73%
May-12	-6.0100%	0.2161%	0.2300%	0.3167%	0.3258%	0.3213%	0.3500%	-6.2400%	-6.3313%	-0.1339%	-0.42%	2.76%	3.86%	-3.18%	-4.28%
Jun-12	4.1200%	4.1004%	0.1800%	0.3033%	0.3150%	0.3092%	0.3400%	3.9400%	3.8108%	3.7604%	5.44%	2.16%	3.71%	3.28%	1.73%
Jul-12	1.3900%	2.8439%	0.2000%	0.2833%	0.2950%	0.2892%	0.3275%	1.1900%	1.1008%	2.5164%	9.12%	2.40%	3.47%	6.72%	5.65%
Aug-12	2.2500%	-4.4721%	0.1800%	0.2900%	0.3008%	0.2954%	0.3333%	2.0700%	1.9546%	-4.8054%	17.99%	2.16%	3.55%	15.83%	14.44%
Sep-12	2.5800%	1.2281%	0.1700%	0.2908%	0.3067%	0.2988%	0.3350%	2.4100%	2.2813%	0.8931%	30.18%	2.04%	3.59%	28.14%	26.60%
Oct-12	-1.8500%	1.7240%	0.2100%	0.2892%	0.3025%	0.2958%	0.3258%	-2.0600%	-2.1458%	1.3982%	15.18%	2.52%	3.55%	12.66%	11.63%
Nov-12	0.5800%	-4.6428%	0.1900%	0.2917%	0.2975%	0.2946%	0.3200%	0.3900%	0.2854%	-4.9628%	16.11%	2.28%	3.54%	13.83%	12.57%
Dec-12	0.9100%	0.1108%	0.1900%	0.3042%	0.3083%	0.3063%	0.3333%	0.7200%	0.6038%	-0.2225%	15.98%	2.28%	3.68%	13.70%	12.31%
Jan-13	5.1800%	3.5100%	0.2200%	0.3167%	0.3225%	0.3196%	0.3458%	4.9600%	4.8604%	3.1642%	16.76%	2.64%	3.84%	14.12%	12.92%
Feb-13	1.3600%	3.3900%	0.2200%	0.3250%	0.3292%	0.3271%	0.3483%	1.1400%	1.0329%	3.0417%	13.45%	2.64%	3.93%	10.81%	9.52%
Mar-13	3.7500%	5.4000%	0.2100%	0.3167%	0.3225%	0.3196%	0.3458%	3.5400%	3.4304%	5.0542%	13.95%	2.52%	3.84%	11.43%	10.12%
Apr-13	1.9300%	5.9000%	0.2600%	0.3108%	0.3142%	0.3125%	0.3333%	1.6700%	1.6175%	5.5667%	16.89%	3.12%	3.75%	13.77%	13.14%
May-13	2.3400%	-8.9600%	0.2300%	0.3242%	0.3283%	0.3263%	0.3475%	2.1100%	2.0138%	-9.3075%	27.27%	2.76%	3.92%	24.51%	23.36%
Jun-13	-1.3400%	1.1400%	0.2400%	0.3558%	0.3600%	0.3579%	0.3775%	-1.5800%	-1.6979%	0.7625%	20.60%	2.88%	4.30%	17.72%	16.30%

	Market Return	S&P Return	Ibbot LT RF	Aaa Corp	Aa Corp	Avg Aaa and Aa Corp	A PU	RPMKT	RPAAAAA	RPSPA	Mkt Annlized Return	RF Annualized Yield	AAAAA Annualized Yield	MRP RP	AAAAA RP
Jul-13	5.0900%	3.8500%	0.3000%	0.3617%	0.3717%	0.3667%	0.3900%	4.7900%	4.7233%	3.4600%	25.00%	3.60%	4.40%	21.40%	20.60%
Aug-13	-2.9000%	-5.0000%	0.2800%	0.3783%	0.3858%	0.3821%	0.3942%	-3.1800%	-3.2821%	-5.3942%	18.70%	3.36%	4.59%	15.34%	14.12%
Sep-13	3.1400%	1.0800%	0.2900%	0.3867%	0.3908%	0.3888%	0.4000%	2.8500%	2.7513%	0.6800%	19.35%	3.48%	4.67%	15.87%	14.68%
Oct-13	4.6000%	3.7700%	0.2900%	0.3775%	0.3825%	0.3800%	0.3917%	4.3100%	4.2200%	3.3783%	27.19%	3.48%	4.56%	23.71%	22.63%
Nov-13	3.0500%	-1.9900%	0.2700%	0.3858%	0.3892%	0.3875%	0.3975%	2.7800%	2.6625%	-2.3875%	30.32%	3.24%	4.65%	27.08%	25.67%
Dec-13	2.5300%	0.7600%	0.3100%	0.3850%	0.3900%	0.3875%	0.4008%	2.2200%	2.1425%	0.3592%	32.41%	3.72%	4.65%	28.69%	27.76%
Jan-14	-3.4600%	2.8100%	0.3200%	0.3742%	0.3775%	0.3758%	0.3858%	-3.7800%	-3.8358%	2.4242%	21.53%	3.84%	4.51%	17.69%	17.02%
Feb-14	4.5700%	3.3500%	0.2600%	0.3708%	0.3717%	0.3713%	0.3775%	4.3100%	4.1988%	2.9725%	25.38%	3.12%	4.46%	22.26%	20.93%
Mar-14	0.8400%	3.3700%	0.2900%	0.3650%	0.3700%	0.3675%	0.3758%	0.5500%	0.4725%	2.9942%	21.86%	3.48%	4.41%	18.38%	17.45%
Apr-14	0.7400%	4.2600%	0.2800%	0.3533%	0.3608%	0.3571%	0.3675%	0.4600%	0.3829%	3.8925%	20.44%	3.36%	4.29%	17.08%	16.16%
May-14	2.3500%	-1.0500%	0.2800%	0.3467%	0.3500%	0.3483%	0.3550%	2.0700%	2.0017%	-1.4050%	20.45%	3.36%	4.18%	17.09%	16.27%
Jun-14	2.0700%	4.4800%	0.2500%	0.3542%	0.3550%	0.3546%	0.3575%	1.8200%	1.7154%	4.1225%	24.62%	3.00%	4.26%	21.62%	20.36%
Jul-14	-1.3800%	-6.8000%	0.2700%	0.3467%	0.3500%	0.3483%	0.3525%	-1.6500%	-1.7283%	-7.1525%	16.94%	3.24%	4.18%	13.70%	12.76%
Aug-14	4.0000%	4.9500%	0.2600%	0.3400%	0.3417%	0.3408%	0.3442%	3.7400%	3.6592%	4.6058%	25.25%	3.12%	4.09%	22.13%	21.16%
Sep-14	-1.4000%	-1.8600%	0.2300%	0.3425%	0.3492%	0.3458%	0.3533%	-1.6300%	-1.7458%	-2.2133%	19.74%	2.76%	4.15%	16.98%	15.59%
Oct-14	2.4400%	8.0200%	0.2500%	0.3267%	0.3325%	0.3296%	0.3383%	2.1900%	2.1104%	7.6817%	17.27%	3.00%	3.96%	14.27%	13.31%
Nov-14	2.6900%	1.2000%	0.2300%	0.3267%	0.3367%	0.3317%	0.3408%	2.4600%	2.3583%	0.8592%	16.86%	2.76%	3.98%	14.10%	12.88%
Dec-14	-0.2500%	3.5000%	0.2200%	0.3158%	0.3242%	0.3200%	0.3292%	-0.4700%	-0.5700%	3.1708%	13.69%	2.64%	3.84%	11.05%	9.85%
Jan-15	-3.0000%	2.3300%	0.2000%	0.2883%	0.2950%	0.2917%	0.2983%	-3.2000%	-3.2917%	2.0317%	14.23%	2.40%	3.50%	11.83%	10.73%
Feb-15	5.7500%	-6.3300%	0.1500%	0.3008%	0.3033%	0.3021%	0.3058%	5.6000%	5.4479%	-6.6358%	15.52%	1.80%	3.63%	13.72%	11.90%
Mar-15	-1.5800%	-0.4900%	0.2100%	0.3033%	0.3083%	0.3058%	0.3117%	-1.7900%	-1.8858%	-0.8017%	12.75%	2.52%	3.67%	10.23%	9.08%
Apr-15	0.9600%	-1.2900%	0.1900%	0.2933%	0.3033%	0.2983%	0.3125%	0.7700%	0.6617%	-1.6025%	12.99%	2.28%	3.58%	10.71%	9.41%
May-15	1.2900%	0.6500%	0.2000%	0.3317%	0.3400%	0.3358%	0.3475%	1.0900%	0.9542%	0.3025%	11.82%	2.40%	4.03%	9.42%	7.79%
Jun-15	-1.9400%	-6.0000%	0.2300%	0.3492%	0.3558%	0.3525%	0.3658%	-2.1700%	-2.2925%	-6.3658%	7.43%	2.76%	4.23%	4.67%	3.20%
Jul-15	2.1000%	4.8100%	0.2400%	0.3458%	0.3542%	0.3500%	0.3667%	1.8600%	1.7500%	4.4433%	11.22%	2.88%	4.20%	8.34%	7.02%
Aug-15	-6.0300%	-3.9700%	0.2200%	0.3367%	0.3442%	0.3404%	0.3542%	-6.2500%	-6.3704%	-4.3242%	0.50%	2.64%	4.09%	-2.14%	-3.59%
Sep-15	-2.4700%	2.9000%	0.2100%	0.3392%	0.3508%	0.3450%	0.3658%	-2.6800%	-2.8150%	2.5342%	-0.60%	2.52%	4.14%	-3.12%	-4.74%
Oct-15	8.4400%	1.0800%	0.2100%	0.3292%	0.3425%	0.3358%	0.3575%	8.2300%	8.1042%	0.7225%	5.23%	2.52%	4.03%	2.71%	1.20%
Nov-15	0.3000%	-2.1300%	0.2200%	0.3383%	0.3508%	0.3446%	0.3667%	0.0800%	-0.0446%	-2.4967%	2.78%	2.64%	4.14%	0.14%	-1.36%
Dec-15	-1.5800%	2.1600%	0.2200%	0.3308%	0.3467%	0.3388%	0.3625%	-1.8000%	-1.9188%	1.7975%	1.41%	2.64%	4.07%	-1.23%	-2.66%
Jan-16	-4.9600%	4.9223%	0.2100%	0.3333%	0.3433%	0.3383%	0.3558%	-5.1700%	-5.2983%	4.5665%	-0.64%	2.52%	4.06%	-3.16%	-4.70%
Feb-16	-0.1300%	1.9408%	0.2000%	0.3300%	0.3317%	0.3308%	0.3425%	-0.3300%	-0.4608%	1.5983%	-6.17%	2.40%	3.97%	-8.57%	-10.14%
Mar-16	6.7800%	8.1400%	0.1800%	0.3183%	0.3258%	0.3221%	0.3467%	6.6000%	6.4579%	7.7933%	1.80%	2.16%	3.87%	-0.36%	-2.06%
Apr-16	0.3900%	-2.4100%	0.1700%	0.3183%	0.3258%	0.3221%	0.3467%	0.2200%	0.0679%	-2.7567%	1.23%	2.04%	3.87%	-0.81%	-2.64%
May-16	1.8000%	1.5100%	0.2000%	0.3042%	0.3083%	0.3063%	0.3275%	1.6000%	1.4938%	1.1825%	1.74%	2.40%	3.68%	-0.66%	-1.94%
Jun-16	0.2600%	7.7900%	0.1800%	0.2917%	0.3000%	0.2958%	0.3150%	0.0800%	-0.0358%	7.4750%	4.02%	2.16%	3.55%	1.86%	0.47%
Jul-16	3.6900%	-0.8000%	0.1400%	0.2733%	0.2825%	0.2779%	0.2975%	3.5500%	3.4121%	-1.0975%	5.64%	1.68%	3.34%	3.96%	2.31%
Aug-16	0.1400%	-5.5100%	0.1600%	0.2767%	0.2850%	0.2808%	0.2992%	-0.0200%	-0.1408%	-5.8092%	12.58%	1.92%	3.37%	10.66%	9.21%
Sep-16	0.0200%	0.4000%	0.1500%	0.2842%	0.2917%	0.2879%	0.3050%	-0.1300%	-0.2679%	0.0950%	15.45%	1.80%	3.46%	13.65%	12.00%
Oct-16	-1.8200%	0.8600%	0.1600%	0.2842%	0.2917%	0.2879%	0.3050%	-1.9800%	-2.1079%	0.5550%	4.53%	1.92%	3.46%	2.61%	1.07%
Nov-16	3.7000%	-5.3900%	0.1800%	0.3217%	0.3275%	0.3246%	0.3400%	3.5200%	3.3754%	-5.7300%	8.07%	2.16%	3.90%	5.91%	4.18%
Dec-16	1.9800%	4.9400%	0.2200%	0.3383%	0.3433%	0.3408%	0.3558%	1.7600%	1.6392%	4.5842%	11.98%	2.64%	4.09%	9.34%	7.89%
Jan-17	1.9000%	1.2600%	0.2400%	0.3267%	0.3317%	0.3292%	0.3300%	1.6600%	1.5708%	0.9300%	20.06%	2.88%	3.95%	17.18%	16.11%
Feb-17	3.9700%	5.2600%	0.2100%	0.3292%	0.3342%	0.3317%	0.3325%	3.7600%	3.6383%	4.9275%	24.99%	2.52%	3.98%	22.47%	21.01%
Mar-17	0.1200%	2.9800%	0.2300%	0.3292%	0.3342%	0.3317%	0.3325%	-0.1100%	-0.2117%	2.6475%	17.20%	2.76%	3.98%	14.44%	13.22%
Apr-17	1.0300%	0.7800%	0.2100%	0.3225%	0.3275%	0.3250%	0.3275%	0.8200%	0.7050%	0.4525%	17.94%	2.52%	3.90%	15.42%	14.04%
May-17	1.4100%	4.2200%	0.2400%	0.3208%	0.3275%	0.3242%	0.3275%	1.1700%	1.0858%	3.8925%	17.49%	2.88%	3.89%	14.61%	13.60%
Jun-17	0.6200%	-2.7000%	0.2100%	0.3067%	0.3142%	0.3104%	0.3142%	0.4100%	0.3096%	-3.0142%	17.91%	2.52%	3.73%	15.39%	14.19%
Jul-17	2.0600%	2.4400%	0.2200%	0.3150%	0.3225%	0.3188%	0.3233%	1.8400%	1.7413%	2.1167%	16.06%	2.64%	3.83%	13.42%	12.24%
Aug-17	0.3100%	3.2400%	0.2200%	0.3083%	0.3167%	0.3125%	0.3183%	0.0900%	-0.0025%	2.9217%	16.26%	2.64%	3.75%	13.62%	12.51%
Sep-17	2.0600%	-2.7300%	0.1900%	0.3025%	0.3100%	0.3063%	0.3058%	1.8700%	1.7538%	-3.0358%	18.63%	2.28%	3.68%	16.35%	14.95%
Oct-17	2.3300%	3.9000%	0.2200%	0.3000%	0.3117%	0.3058%	0.3117%	2.1100%	2.0242%	3.5883%	23.64%	2.64%	3.67%	21.00%	19.97%
Nov-17	3.0700%	2.7500%	0.2100%	0.3000%	0.3117%	0.3058%	0.3117%	2.8600%	2.7642%	2.4383%	22.89%	2.52%	3.67%	20.37%	19.22%
Dec-17	1.1100%	-6.1300%	0.2000%	0.2925%	0.3008%	0.2967%	0.3017%	0.9100%	0.8133%	-6.4317%	21.84%	2.40%	3.56%	19.44%	18.28%
Jan-18	5.7300%	-3.0700%	0.2400%	0.2925%	0.3008%	0.2967%	0.3158%	5.4900%	5.4333%	-3.3858%	26.42%	2.88%	3.56%	23.54%	22.86%
Feb-18	-3.6900%	-3.8400%	0.2200%	0.2958%	0.3067%	0.3013%	0.3217%	-3.9100%	-3.9913%	-4.1617%	17.11%	2.64%	3.62%	14.47%	13.49%
Mar-18	-2.5400%	3.7700%	0.2400%	0.3225%	0.3325%	0.3275%	0.3442%	-2.7800%	-2.8675%	3.4258%	14.00%	2.88%	3.93%	11.12%	10.07%
Apr-18	0.3800%	2.1000%	0.2500%	0.3208%	0.3342%	0.3275%	0.3475%	0.1300%	0.0525%	1.7525%	13.26%	3.00%	3.93%	10.26%	9.33%
May-18	2.4100%	-1.1400%	0.2500%	0.3325%	0.3433%	0.3379%	0.3567%	2.1600%	2.0721%	-1.4967%	14.38%	3.00%	4.06%	11.38%	10.33%
Jun-18	0.6200%	2.7300%	0.2300%	0.3300%	0.3425%	0.3363%	0.3558%	0.3900%	0.2838%	2.3742%	14.38%	2.76%	4.04%	11.62%	10.35%
Jul-18	3.7200%	1.8600%	0.2500%	0.3225%	0.3392%	0.3308%	0.3558%	3.4700%	3.3892%	1.5042%	16.24%	3.00%	3.97%	13.24%	12.27%
Aug-18	3.2600%	1.1300%	0.2500%	0.3233%	0.3375%	0.3304%	0.3550%	3.0100%	2.9296%	0.7750%	19.66%	3.00%	3.97%	16.66%	15.70%
Sep-18	0.5700%	-0.6000%	0.2200%	0.3233%	0.3375%	0.3304%	0.3550%	0.3500%	0.2396%	-0.9550%	17.91%	2.64%	3.97%	15.27%	13.95%
Oct-18	-6.8400%	1.9500%	0.3000%	0.3450%	0.3567%	0.3508%	0.3708%	-7.1400%	-7.1908%	1.5792%	7.35%	3.60%	4.21%	3.75%	3.14%
Nov-18	2.0400%	3.5500%	0.2800%	0.3517%	0.3683%	0.3600%	0.3775%	1.7600%	1.6800%	3.1725%	6.27%	3.36%	4.32%	2.91%	1.95%
Dec-18	-9.0300%	-4.0100%	0.2700%	0.3517%	0.3642%	0.3579%	0.3775%	-9.3000%	-9.3879%	-4.3875%	-4.38%	3.24%	4.30%	-7.62%	-8.68%
Jan-19	8.0100%	4.8400%	0.2500%	0.3275%	0.3450%	0.3363%	0.3625%	7.7600%	7.6738%	4.4775%	-2.32%	3.00%	4.04%	-5.32%	-6.36%
Feb-19	3.2100%	4.1100%	0.2200%	0.3158%	0.3325%	0.3242%	0.3542%	2.9900%	2.8858%	3.7558%	4.68%	2.64%	3.89%	2.04%	0.79%
Mar-19	1.9400%	2.8800%	0.2300%	0.3158%	0.3325%	0.3242%	0.3542%	1.7100%	1.6158%	2.5258%	9.49%	2.76%	3.89%	6.73%	5.60%
Apr-19	4.0500%	0.9300%	0.2300%	0.3075%	0.3208%	0.3142%	0.3400%	3.8200%	3.7358%	0.5900%	13.49%	2.76%	3.77%	10.73%	9.72%
May-19	-6.3500%	-0.7800%	0.2300%	0.3058%	0.3167%	0.3113%	0.3317%	-6.5800%	-6.6613%	-1.1117%	3.78%	2.76%	3.74%	1.02%	0.05%
Jun-19	7.0500%	3.2200%	0.1800%	0.3058%	0.3167%	0.3113%	0.3317%	6.8700%	6.7388%	2.8883%	10.42%	2.16%	3.74%	8.26%	6.68%
Jul-19	1.4400%	-0.2700%	0.2100%	0.2742%	0.2883%	0.2813%	0.3075%	1.2300%	1.1588%	-0.5775%	7.99%	2.52%	3.38%	5.47%	4.61%
Aug-19	-1.5800%	5.1300%	0.1900%	0.2742%	0.2883%	0.2813%	0.3075%	-1.7700%	-1.8613%	4.8225%	2.93%	2.28%	3.38%	0.65%	-0.45%
Sep-19	1.8700%	4.2500%	0.1500%	0.2483%	0.2567%	0.2525%	0.2742%	1.7200%	1.6175%	3.9758%	4.26%	1.80%	3.03%	2.46%	1.23%
Oct-19	2.1700%	-0.7700%	0.1600%	0.2525%	0.2608%	0.2567%	0.2808%	2.0100%	1.9133%	-1.0508%	14.34%	1.92%	3.08%	12.42%	11.26%
Nov-19	3.6300%	-1.8600%	0.1600%	0.2558%	0.2642%	0.2600%	0.2858%	3.4700%	3.3700%	-2.1458%	16.12%	1.92%	3.12%	14.20%	13.00%
Dec-19	3.0200%	3.4300%	0.1800%	0.2508%	0.2592%	0.2550%	0.2833%	2.8400%	2.7650%	3.1467%	31.50%	2.16%	3.06%	29.34%	28.44%

S&P U Annulized Yield	A Annulized Yield	SPA RP
57.48%	5.05%	52.43%
71.90%	5.05%	66.85%
69.27%	5.10%	64.17%
56.12%	5.14%	50.98%
47.04%	5.14%	41.90%
50.81%	5.14%	45.67%
91.33%	5.23%	86.10%
110.24%	5.24%	105.00%
117.15%	5.30%	111.85%
111.18%	5.38%	105.80%
48.73%	5.34%	43.39%
5.00%	5.29%	-0.29%
11.03%	5.23%	5.80%
5.30%	5.26%	0.04%
17.34%	5.29%	12.05%
29.22%	5.18%	24.04%
29.14%	5.15%	23.99%
20.43%	5.04%	15.39%
-19.93%	5.01%	-24.94%
-25.28%	4.99%	-30.27%
-31.76%	4.95%	-36.71%
-39.34%	4.86%	-44.20%
-20.19%	4.88%	-25.07%
-13.73%	4.96%	-18.69%
-21.96%	5.11%	-27.07%
-23.41%	5.01%	-28.42%
-18.92%	5.01%	-23.93%
-27.33%	4.98%	-32.31%
-37.13%	4.86%	-41.99%
-42.24%	4.84%	-47.08%
-18.87%	4.87%	-23.74%
-25.23%	4.83%	-30.06%
-23.90%	4.81%	-28.71%
-41.36%	5.05%	-46.41%
-29.82%	5.54%	-35.36%
-28.94%	5.51%	-34.45%
-35.88%	6.24%	-42.12%
-40.38%	6.17%	-46.55%
-44.14%	6.41%	-50.55%
-48.82%	6.06%	-54.88%
-51.57%	6.83%	-58.40%
-61.17%	7.36%	-68.53%
-65.55%	7.57%	-73.12%

SUMMARY OUTPUT

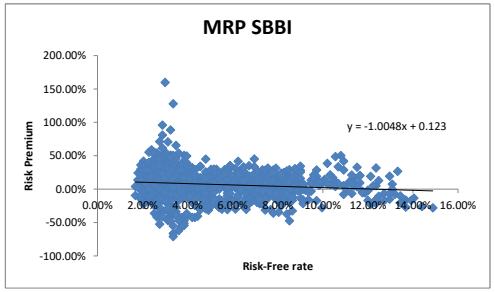
Regression Statistics

Multiple R	0.1283466
R Square	0.0164728
Adjusted R S	0.0155908
Standard Er	0.2106203
Observation	1117

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.828433217	0.8284332	18.67484764	1.68848E-05
Residual	1115	49.46241351	0.0443609		
Total	1116	50.29084673			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.1230087	0.013206047	9.3145702	6.3269E-20	0.097097147	0.1489202	0.0970971	0.1489202
X Variable 1	-1.0047825	0.23251102	-4.3214405	1.68848E-05	-1.460990971	-0.5485741	-1.460991	-0.5485741



Risk-Free Rate	RP
2.11%	10.18%

SUMMARY OUTPUT

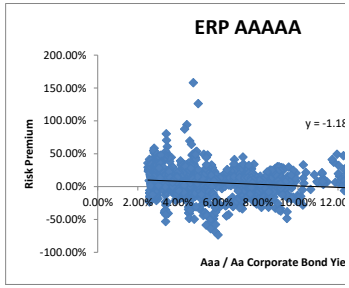
Regression Statistics

Multiple R	0.1579858
R Square	0.0249595
Adjusted R S	0.0240658
Standard Er	0.2103241
Observation	1093

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	1.2354248	1.2354248	27.92790078	1.51995E-07
Residual	1091	48.261718	0.0442362		
Total	1092	49.497143			

	Coefficients	*tandard Erro*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	0.1291992	0.0146702	8.8069203	4.96487E-18	0.100414231	0.1579842
X Variable 1	-1.182957	0.2238462	-5.2846855	1.51995E-07	-1.622174848	-0.7437392



AAA Bond	RP
2.96%	9.42%

S&P U Annulized Yield	A Annualized Yield	SPA RP
-51.07%	7.28%	-58.35%
-33.07%	6.35%	-39.42%
-4.94%	5.91%	-10.85%
-22.56%	5.81%	-28.37%
-20.42%	5.88%	-26.30%
-0.55%	5.85%	-6.40%
-1.68%	5.39%	-7.07%
-27.02%	5.77%	-32.79%
-27.19%	6.34%	-33.53%
8.67%	6.89%	1.78%
77.22%	6.50%	70.72%
100.69%	6.11%	94.58%
32.54%	5.91%	26.63%
-6.06%	5.98%	-12.04%
-20.43%	6.36%	-26.79%
-17.46%	6.36%	-23.82%
-15.97%	7.06%	-23.03%
-21.88%	7.22%	-29.10%
-5.30%	6.56%	-11.86%
15.28%	5.78%	9.50%
27.80%	5.66%	22.14%
-2.40%	5.44%	-7.84%
-23.17%	5.39%	-28.56%
-29.55%	5.40%	-34.95%
-32.74%	5.29%	-38.03%
-30.54%	5.43%	-35.97%
-14.92%	5.56%	-20.48%
-14.50%	5.40%	-19.90%
-13.35%	5.38%	-18.73%
-20.43%	5.36%	-25.79%
-33.82%	5.18%	-39.00%
-39.88%	4.96%	-44.84%
-32.87%	4.88%	-37.75%
-22.23%	4.79%	-27.02%
-6.47%	4.61%	-11.08%
-1.49%	4.53%	-6.02%
27.52%	4.42%	23.10%
31.17%	4.44%	26.73%
28.35%	4.43%	23.92%
54.34%	4.40%	49.94%
56.76%	4.35%	52.41%
76.65%	4.29%	72.36%
100.77%	4.21%	96.56%
118.76%	4.17%	114.59%
98.75%	4.17%	94.58%
63.33%	4.17%	59.16%
58.26%	4.14%	54.12%
48.42%	4.12%	44.30%
50.32%	4.07%	46.25%
42.05%	4.06%	37.99%
40.57%	4.05%	36.52%
32.33%	4.04%	28.29%
28.70%	3.95%	24.75%
20.68%	3.83%	16.85%
10.81%	3.82%	6.99%
10.69%	3.89%	6.80%
4.00%	4.00%	0.00%
4.88%	4.07%	0.81%
-7.56%	4.00%	-11.56%
-14.86%	3.99%	-18.85%
-9.74%	3.94%	-13.68%
-17.74%	3.89%	-21.63%
-25.73%	3.96%	-29.69%
-33.33%	4.09%	-37.42%
-31.64%	4.08%	-35.72%
-37.05%	4.03%	-41.08%
-40.53%	4.01%	-44.54%
-36.25%	4.03%	-40.28%
-45.79%	3.99%	-49.78%
-32.48%	4.08%	-36.56%
-27.52%	3.95%	-31.47%
-11.64%	3.95%	-15.59%
-23.17%	3.86%	-27.03%
-20.25%	3.84%	-24.09%
-7.91%	3.88%	-11.79%
14.58%	3.79%	10.79%
6.63%	3.73%	2.90%
22.44%	3.74%	18.70%
29.22%	3.68%	25.54%
34.96%	3.59%	31.37%
45.17%	3.54%	41.63%

Multiple R	0.1283466

Multiple R	0.1579858

S&P U Annulized Yield	A Annualized Yield	SPA RP
29.40%	3.55%	25.85%
35.55%	3.50%	32.05%
11.70%	3.47%	8.23%
23.37%	3.43%	19.94%
22.19%	3.41%	18.78%
24.95%	3.71%	21.24%
7.26%	3.58%	3.68%
12.55%	3.41%	9.14%
11.26%	3.38%	7.88%
10.21%	3.34%	6.87%
1.00%	3.35%	-2.35%
18.24%	3.34%	14.90%
13.91%	3.25%	10.66%
-14.17%	3.30%	-17.47%
3.12%	3.34%	-0.22%
-7.40%	3.23%	-10.63%
-1.92%	3.21%	-5.13%
-7.87%	3.18%	-11.05%
-6.17%	3.15%	-9.32%
-16.18%	3.11%	-19.29%
-17.14%	3.10%	-20.24%
-18.40%	3.15%	-21.55%
-19.48%	3.20%	-22.68%
-22.47%	3.16%	-25.63%
-28.35%	3.14%	-31.49%
-13.84%	3.08%	-16.92%
-23.20%	3.03%	-26.23%
-19.59%	3.00%	-22.59%
-20.38%	2.98%	-23.36%
-20.96%	3.00%	-23.96%
-29.89%	3.00%	-32.89%
-25.46%	2.98%	-28.44%
-31.57%	3.06%	-34.63%
-29.25%	3.09%	-32.34%
-30.02%	3.09%	-33.11%
-35.53%	3.12%	-38.65%
-32.63%	3.09%	-35.72%
-23.62%	3.10%	-26.72%
-25.11%	3.12%	-28.23%
-28.65%	3.10%	-31.75%
-27.06%	3.10%	-30.16%
-21.44%	3.08%	-24.52%
-2.48%	3.08%	-5.56%
4.17%	3.07%	1.10%
15.41%	3.06%	12.35%
26.28%	3.05%	23.23%
40.10%	3.02%	37.08%
62.92%	3.01%	59.91%
76.86%	3.00%	73.86%
67.03%	3.00%	64.03%
75.02%	2.98%	72.04%
74.99%	2.96%	72.03%
76.36%	2.96%	73.40%
73.95%	2.96%	70.99%
54.36%	2.97%	51.39%
42.61%	2.98%	39.63%
46.06%	2.99%	43.07%
31.59%	2.99%	28.60%
24.96%	2.99%	21.97%
21.27%	2.97%	18.30%
15.69%	2.99%	12.70%
15.17%	2.99%	12.18%
15.04%	2.99%	12.05%
14.94%	2.96%	11.98%
17.81%	2.94%	14.87%
12.41%	2.93%	9.48%
13.04%	2.94%	10.10%
20.95%	2.96%	17.99%
18.04%	2.97%	15.07%
22.61%	2.99%	19.62%
28.82%	2.98%	25.84%
22.95%	2.97%	19.98%
37.30%	2.95%	34.35%
35.57%	2.92%	32.65%
37.32%	2.87%	34.45%
36.23%	2.83%	33.40%
31.94%	2.80%	29.14%
43.85%	2.79%	41.06%
50.97%	2.79%	48.18%
60.16%	2.77%	57.39%
53.32%	2.75%	50.57%

Multiple R 0.1283466

Multiple R 0.1579858

S&P U Annulized Yield	A Annualized Yield	SPA RP
63.57%	2.69%	60.88%
43.16%	2.67%	40.49%
57.82%	2.66%	55.16%
47.44%	2.65%	44.79%
49.32%	2.69%	46.63%
36.19%	2.70%	33.49%
31.48%	2.69%	28.79%
21.58%	2.71%	18.87%
1.32%	2.75%	-1.43%
-2.69%	2.76%	-5.45%
-6.53%	2.76%	-9.29%
1.25%	2.76%	-1.51%
-9.60%	2.72%	-12.32%
-4.28%	2.72%	-7.00%
-13.24%	2.72%	-15.96%
-18.76%	2.70%	-21.46%
-23.34%	2.70%	-26.04%
-17.79%	2.71%	-20.50%
-12.58%	2.73%	-15.31%
-5.96%	2.73%	-8.69%
3.59%	2.80%	0.79%
0.02%	2.88%	-2.86%
-8.76%	2.93%	-11.69%
-13.16%	3.05%	-16.21%
-12.54%	3.05%	-15.59%
-15.03%	3.05%	-18.08%
-6.38%	3.02%	-9.40%
-1.74%	2.97%	-4.71%
6.97%	2.94%	4.03%
4.76%	2.94%	1.82%
-1.98%	2.99%	-4.97%
-1.41%	3.03%	-4.44%
-0.70%	3.05%	-3.75%
4.69%	3.03%	1.66%
3.68%	3.07%	0.61%
4.00%	3.06%	0.94%
8.48%	2.99%	5.49%
12.73%	2.99%	9.74%
10.05%	2.97%	7.08%
8.94%	2.96%	5.98%
3.29%	2.95%	0.34%
-0.21%	2.94%	-3.15%
10.36%	2.90%	7.46%
13.77%	2.86%	10.91%
18.85%	2.85%	16.00%
15.53%	2.83%	12.70%
29.16%	2.81%	26.35%
31.37%	2.78%	28.59%
29.48%	2.76%	26.72%
30.71%	2.76%	27.95%
27.18%	2.76%	24.42%
28.78%	2.77%	26.01%
30.81%	2.79%	28.02%
22.37%	2.79%	19.58%
10.73%	2.79%	7.94%
8.68%	2.76%	5.92%
9.15%	2.80%	6.35%
7.65%	2.83%	4.82%
4.10%	2.86%	1.24%
3.26%	2.86%	0.40%
4.10%	2.83%	1.27%
5.83%	2.84%	2.99%
3.13%	2.95%	0.18%
1.30%	3.09%	-1.79%
0.05%	3.13%	-3.08%
7.98%	3.21%	4.77%
17.86%	3.26%	14.60%
17.83%	3.19%	14.64%
14.08%	3.14%	10.94%
14.72%	3.17%	11.55%
18.17%	3.24%	14.93%
18.63%	3.29%	15.34%
17.12%	3.29%	13.83%
14.74%	3.23%	11.51%
18.82%	3.25%	15.57%
16.94%	3.23%	13.71%
18.38%	3.22%	15.16%
19.43%	3.22%	16.21%
16.77%	3.22%	13.55%
17.35%	3.24%	14.11%
16.53%	3.24%	13.29%

Multiple R	0.1283466

Multiple R	0.1579858

S&P U Annulized Yield	A Annualized Yield	SPA RP
17.37%	3.26%	14.11%
20.88%	3.24%	17.64%
19.26%	3.22%	16.04%
16.92%	3.25%	13.67%
15.45%	3.30%	12.15%
12.97%	3.36%	9.61%
12.53%	3.47%	9.06%
10.70%	3.63%	7.07%
7.15%	3.71%	3.44%
8.61%	3.66%	4.95%
6.62%	3.61%	3.01%
7.73%	3.62%	4.11%
11.04%	3.49%	7.55%
9.45%	3.40%	6.05%
7.85%	3.38%	4.47%
10.24%	3.32%	6.92%
12.28%	3.23%	9.05%
15.81%	3.16%	12.65%
19.51%	3.16%	16.35%
22.29%	3.14%	19.15%
26.93%	3.16%	23.77%
28.77%	3.14%	25.63%
26.88%	3.13%	23.75%
27.62%	3.12%	24.50%
18.07%	3.12%	14.95%
21.41%	3.11%	18.30%
24.75%	3.11%	21.64%
22.53%	3.13%	19.40%
25.28%	3.14%	22.14%
20.65%	3.15%	17.50%
21.61%	3.15%	18.46%
17.88%	3.19%	14.69%
19.22%	3.21%	16.01%
18.89%	3.21%	15.68%
21.09%	3.24%	17.85%
15.53%	3.27%	12.26%
18.92%	3.30%	15.62%
15.85%	3.32%	12.53%
11.28%	3.35%	7.93%
10.04%	3.31%	6.73%
8.27%	3.29%	4.98%
13.79%	3.29%	10.50%
8.33%	3.40%	4.93%
7.46%	3.48%	3.98%
7.46%	3.49%	3.97%
8.07%	3.55%	4.52%
4.73%	3.63%	1.10%
4.41%	3.72%	0.69%
5.97%	3.79%	2.18%
3.25%	3.82%	-0.57%
5.03%	3.91%	1.12%
8.11%	3.96%	4.15%
5.57%	4.05%	1.52%
2.36%	4.05%	-1.69%
9.62%	4.01%	5.61%
13.16%	4.01%	9.15%
6.19%	4.09%	2.10%
1.24%	4.20%	-2.96%
0.88%	4.37%	-3.49%
2.76%	4.55%	-1.79%
1.37%	4.61%	-3.24%
5.41%	4.62%	0.79%
6.36%	4.36%	2.00%
9.22%	3.93%	5.29%
11.40%	3.96%	7.44%
12.75%	4.13%	8.62%
13.98%	3.95%	10.03%
13.80%	4.01%	9.79%
20.81%	3.99%	16.82%
21.70%	4.04%	17.66%
24.55%	4.29%	20.26%
30.48%	4.55%	25.93%
36.79%	4.56%	32.23%
34.63%	4.47%	30.16%
40.70%	4.49%	36.21%
34.49%	4.52%	29.97%
35.41%	4.50%	30.91%
34.11%	4.47%	29.64%
27.17%	4.56%	22.61%
23.62%	4.77%	18.85%
20.46%	4.86%	15.60%

Multiple R	0.1283466

Multiple R	0.1579858

S&P U Annulized Yield	A Annualized Yield	SPA RP
23.58%	4.88%	18.70%
26.59%	4.89%	21.70%
17.71%	5.03%	12.68%
14.89%	4.96%	9.93%
11.96%	4.90%	7.06%
7.49%	4.96%	2.53%
4.92%	5.02%	-0.10%
4.67%	5.00%	-0.33%
5.07%	4.91%	0.16%
6.16%	4.79%	1.37%
9.95%	4.86%	5.09%
15.45%	4.84%	10.61%
10.21%	4.79%	5.42%
13.75%	4.64%	9.11%
12.32%	4.57%	7.75%
10.45%	4.61%	5.84%
14.70%	4.62%	10.08%
20.24%	4.65%	15.59%
29.08%	4.64%	24.44%
31.31%	4.59%	26.72%
33.61%	4.48%	29.13%
34.06%	4.48%	29.58%
32.75%	4.52%	28.23%
24.65%	4.57%	20.08%
31.25%	4.65%	26.60%
30.65%	4.73%	25.92%
36.81%	4.73%	32.08%
43.55%	4.71%	38.84%
42.84%	4.68%	38.16%
29.31%	4.65%	24.66%
17.31%	4.65%	12.66%
16.67%	4.66%	12.01%
13.98%	4.64%	9.34%
8.77%	4.59%	4.18%
-2.45%	4.51%	-6.96%
-5.65%	4.48%	-10.13%
-3.25%	4.50%	-7.75%
-4.95%	4.53%	-9.48%
-7.50%	4.51%	-12.01%
-11.86%	4.49%	-16.35%
-8.17%	4.45%	-12.62%
-2.46%	4.44%	-6.90%
6.90%	4.39%	2.51%
1.65%	4.37%	-2.72%
2.71%	4.37%	-1.66%
8.93%	4.37%	4.56%
20.70%	4.37%	16.33%
26.13%	4.37%	21.76%
19.45%	4.39%	15.06%
21.24%	4.38%	16.86%
22.20%	4.40%	17.80%
21.97%	4.41%	17.56%
12.34%	4.42%	7.92%
12.39%	4.46%	7.93%
7.80%	4.49%	3.31%
10.42%	4.50%	5.92%
8.03%	4.51%	3.52%
6.29%	4.52%	1.77%
5.88%	4.53%	1.35%
9.71%	4.55%	5.16%
13.48%	4.54%	8.94%
9.19%	4.54%	4.65%
13.99%	4.53%	9.46%
16.26%	4.51%	11.75%
18.55%	4.53%	14.02%
15.90%	4.54%	11.36%
18.69%	4.53%	14.16%
18.42%	4.51%	13.91%
18.92%	4.50%	14.42%
19.42%	4.49%	14.93%
18.03%	4.50%	13.53%
11.41%	4.52%	6.89%
7.52%	4.54%	2.98%
8.23%	4.58%	3.65%
8.48%	4.63%	3.85%
8.10%	4.66%	3.44%
5.64%	4.71%	0.93%
4.66%	4.83%	-0.17%
-2.09%	4.86%	-6.95%
-6.22%	4.92%	-11.14%
-6.71%	5.14%	-11.85%

Multiple R	0.1283466

Multiple R	0.1579858

S&P U Annulized Yield	A Annualized Yield	SPA RP
-6.13%	5.25%	-11.38%
-8.14%	5.25%	-13.39%
-6.62%	5.40%	-12.02%
-7.51%	5.45%	-12.96%
-16.41%	5.58%	-21.99%
-14.11%	5.81%	-19.92%
-6.98%	5.74%	-12.72%
-6.60%	5.63%	-12.23%
-4.46%	5.67%	-10.13%
1.13%	5.46%	-4.33%
3.84%	5.28%	-1.44%
6.37%	5.44%	0.93%
6.68%	5.42%	1.26%
4.37%	5.66%	-1.29%
4.90%	5.84%	-0.94%
6.95%	5.94%	1.01%
16.44%	5.96%	10.48%
10.75%	6.05%	4.70%
-4.82%	6.18%	-11.00%
-1.28%	6.48%	-7.76%
-0.65%	6.67%	-7.32%
-2.48%	6.54%	-9.02%
-3.23%	6.37%	-9.60%
-8.89%	6.41%	-15.30%
-8.24%	6.58%	-14.82%
-3.95%	6.62%	-10.57%
5.18%	6.62%	-1.44%
2.36%	6.53%	-4.17%
3.07%	6.27%	-3.20%
4.49%	6.27%	-1.78%
11.78%	6.40%	5.38%
17.08%	6.59%	10.49%
10.31%	6.87%	3.44%
11.26%	7.04%	4.22%
7.85%	7.13%	0.72%
11.26%	7.27%	3.99%
9.78%	7.30%	2.48%
10.40%	7.16%	3.24%
-3.11%	7.41%	-10.52%
-5.97%	7.52%	-13.49%
-7.08%	7.44%	-14.52%
-11.42%	7.63%	-19.05%
-5.17%	8.02%	-13.19%
-17.21%	8.00%	-25.21%
-15.40%	8.59%	-23.99%
-20.58%	8.69%	-29.27%
-7.28%	8.51%	-15.79%
-4.21%	8.31%	-12.52%
-14.30%	8.31%	-22.61%
-18.66%	8.67%	-27.33%
-19.23%	9.04%	-28.27%
-8.03%	9.06%	-17.09%
-1.57%	8.88%	-10.45%
1.07%	8.82%	-7.75%
-7.79%	8.76%	-16.55%
7.52%	8.79%	-1.27%
16.55%	8.48%	8.07%
25.22%	8.15%	17.07%
10.15%	7.89%	2.26%
11.22%	8.05%	3.17%
18.33%	8.07%	10.26%
20.37%	8.34%	12.03%
32.90%	8.45%	24.45%
18.39%	8.45%	9.94%
9.13%	8.40%	0.73%
8.77%	8.18%	0.59%
12.30%	8.10%	4.20%
1.76%	7.96%	-6.20%
2.43%	7.90%	-5.47%
-0.88%	7.79%	-8.67%
-0.50%	7.78%	-8.28%
-4.03%	7.77%	-11.80%
-3.32%	7.82%	-11.14%
0.03%	7.84%	-7.81%
-5.82%	7.77%	-13.59%
-3.79%	7.82%	-11.61%
4.31%	7.64%	-3.33%
6.14%	7.61%	-1.47%
11.16%	7.66%	3.50%
18.92%	7.60%	11.32%
8.14%	7.48%	0.66%

Multiple R	0.1283466

Multiple R	0.1579858

S&P U Annulized Yield	A Annualized Yield	SPA RP
4.16%	7.52%	-3.36%
4.22%	7.62%	-3.40%
3.19%	7.66%	-4.47%
5.61%	7.63%	-2.02%
6.50%	7.63%	-1.13%
6.96%	7.71%	-0.75%
4.98%	7.82%	-2.84%
-3.54%	8.04%	-11.58%
3.62%	8.04%	-4.42%
-6.49%	8.02%	-14.51%
-22.40%	8.15%	-30.55%
-18.07%	8.24%	-26.31%
-10.73%	8.36%	-19.09%
-8.04%	8.42%	-16.46%
-10.41%	8.46%	-18.87%
-21.63%	8.77%	-30.40%
-25.92%	9.00%	-34.92%
-28.96%	9.32%	-38.28%
-28.16%	9.66%	-37.82%
-32.50%	10.03%	-42.53%
-37.87%	10.45%	-48.32%
-27.61%	10.78%	-38.39%
-18.98%	10.46%	-29.44%
-21.56%	10.27%	-31.83%
-10.43%	10.37%	-20.80%
-9.69%	9.99%	-19.68%
-8.06%	9.72%	-17.78%
4.15%	10.06%	-5.91%
18.92%	10.23%	8.69%
39.56%	10.10%	29.46%
33.64%	10.01%	23.63%
43.28%	10.12%	33.16%
43.82%	10.19%	33.63%
37.51%	10.16%	27.35%
44.04%	10.04%	34.00%
44.51%	10.11%	34.40%
32.33%	9.90%	22.43%
25.82%	9.71%	16.11%
29.88%	9.67%	20.21%
32.21%	9.53%	22.68%
19.99%	9.55%	10.44%
12.07%	9.54%	2.53%
22.12%	9.37%	12.75%
29.54%	9.13%	20.41%
35.14%	8.90%	26.24%
25.94%	8.79%	17.15%
24.94%	8.76%	16.18%
31.81%	8.62%	23.19%
21.42%	8.61%	12.81%
21.22%	8.65%	12.57%
21.24%	8.70%	12.54%
23.32%	8.71%	14.61%
27.70%	8.71%	18.99%
30.09%	8.58%	21.51%
27.87%	8.51%	19.36%
18.80%	8.49%	10.31%
17.27%	8.46%	8.81%
14.04%	8.61%	5.43%
15.29%	8.64%	6.65%
8.66%	8.64%	0.02%
2.50%	8.92%	-6.42%
5.81%	8.97%	-3.16%
7.97%	8.98%	-1.01%
6.88%	9.09%	-2.21%
5.13%	9.22%	-4.09%
0.18%	9.40%	-9.22%
1.68%	9.51%	-7.83%
5.37%	9.32%	-3.95%
2.26%	9.28%	-7.02%
-1.83%	9.46%	-11.29%
-2.07%	9.68%	-11.75%
-3.71%	9.70%	-13.41%
8.75%	9.90%	-1.15%
7.11%	9.84%	-2.73%
5.93%	10.04%	-4.11%
2.21%	10.10%	-7.89%
3.30%	10.30%	-7.00%
6.90%	10.14%	-3.24%
7.17%	9.98%	-2.81%
8.30%	10.14%	-1.84%
6.98%	10.36%	-3.38%

Multiple R	0.1283466

Multiple R	0.1579858

S&P U Annulized Yield	A Annualized Yield	SPA RP
9.04%	11.40%	-2.36%
11.68%	11.89%	-0.21%
13.62%	12.15%	1.47%
6.02%	12.21%	-6.19%
5.64%	13.23%	-7.59%
-1.87%	14.59%	-16.46%
12.57%	14.29%	-1.72%
14.49%	12.74%	1.75%
13.95%	12.40%	1.55%
9.73%	12.15%	-2.42%
7.11%	12.66%	-5.55%
7.80%	13.29%	-5.50%
16.64%	13.54%	3.11%
15.48%	14.01%	1.46%
15.06%	14.66%	0.40%
13.18%	14.27%	-1.09%
13.45%	14.68%	-1.23%
24.82%	15.13%	9.69%
10.51%	15.25%	-4.74%
10.17%	16.12%	-5.95%
9.48%	15.79%	-6.32%
13.67%	16.07%	-2.40%
15.00%	16.45%	-1.45%
11.57%	17.03%	-5.46%
15.29%	17.26%	-1.96%
15.07%	16.42%	-1.34%
11.72%	16.16%	-4.44%
14.26%	16.80%	-2.54%
16.47%	16.92%	-0.45%
13.65%	16.49%	-2.84%
21.04%	16.40%	4.64%
15.42%	16.08%	-0.66%
10.55%	16.34%	-5.79%
4.79%	16.46%	-11.67%
17.76%	15.92%	1.84%
23.43%	15.45%	7.98%
23.91%	14.98%	8.93%
18.43%	14.46%	3.97%
26.55%	14.43%	12.13%
30.77%	14.24%	16.53%
31.17%	14.28%	16.89%
29.22%	14.03%	15.19%
29.50%	13.64%	15.86%
33.61%	13.49%	20.12%
34.12%	13.65%	20.48%
41.47%	13.57%	27.90%
26.69%	13.57%	13.13%
31.65%	13.44%	18.21%
30.08%	13.25%	16.83%
27.21%	13.38%	13.83%
20.01%	13.52%	6.50%
21.29%	13.40%	7.89%
16.36%	13.40%	2.96%
15.52%	13.77%	1.75%
11.02%	14.13%	-3.11%
7.14%	14.88%	-7.74%
9.22%	15.10%	-5.88%
10.21%	14.86%	-4.65%
16.87%	14.43%	2.44%
16.79%	14.19%	2.60%
13.91%	13.83%	0.08%
19.42%	13.25%	6.17%
26.04%	13.07%	12.97%
23.07%	12.99%	10.08%
30.82%	13.03%	17.79%
36.31%	13.80%	22.50%
36.95%	13.59%	23.36%
48.67%	13.17%	35.49%
51.77%	12.14%	39.63%
39.26%	12.06%	27.19%
33.18%	12.14%	21.04%
20.94%	12.13%	8.81%
25.25%	12.01%	13.24%
28.32%	11.51%	16.81%
33.03%	11.01%	22.02%
33.78%	10.80%	22.98%
39.42%	10.32%	29.11%
41.47%	9.51%	31.95%
33.98%	9.13%	24.85%
32.96%	9.57%	23.39%
37.07%	9.65%	27.42%

Multiple R 0.1283466

Multiple R 0.1579858

S&P U Annulized Yield	A Annualized Yield	SPA RP
47.24%	9.35%	37.89%
57.41%	9.31%	48.10%
47.18%	9.50%	37.67%
45.34%	9.53%	35.81%
41.04%	9.29%	31.75%
28.54%	9.12%	19.42%
37.17%	8.94%	28.22%
25.24%	9.00%	16.23%
16.86%	8.93%	7.93%
15.88%	9.35%	6.53%
9.40%	9.87%	-0.47%
7.77%	10.02%	-2.25%
4.54%	10.14%	-5.60%
1.11%	10.44%	-9.33%
14.32%	11.18%	3.15%
1.15%	11.36%	-10.21%
-6.43%	10.82%	-17.26%
-2.96%	10.94%	-13.90%
-1.47%	10.80%	-12.26%
-0.19%	10.12%	-10.30%
-3.62%	10.07%	-13.70%
0.73%	10.52%	-9.79%
6.04%	10.79%	-4.75%
4.78%	10.81%	-6.02%
5.22%	11.02%	-5.80%
-1.41%	11.17%	-12.58%
2.44%	10.67%	-8.22%
13.10%	9.98%	3.12%
18.80%	9.89%	8.91%
18.27%	10.05%	8.22%
12.10%	10.08%	2.01%
11.64%	10.06%	1.58%
21.02%	10.24%	10.78%
28.45%	10.19%	18.26%
29.93%	10.00%	19.92%
27.99%	9.66%	18.33%
38.04%	9.50%	28.54%
39.16%	9.51%	29.65%
35.91%	9.58%	26.33%
33.04%	9.54%	23.50%
38.60%	9.52%	29.09%
47.81%	9.43%	38.37%
28.51%	9.55%	18.96%
29.90%	9.76%	20.15%
28.86%	9.85%	19.02%
16.52%	9.91%	6.61%
17.64%	10.01%	7.63%
13.33%	9.81%	3.52%
4.56%	9.76%	-5.19%
-3.17%	9.90%	-13.06%
-0.87%	10.12%	-10.99%
5.13%	10.06%	-4.93%
3.67%	9.91%	-6.24%
-2.56%	9.73%	-12.29%
2.83%	9.71%	-6.88%
7.59%	9.48%	-1.89%
7.71%	9.55%	-1.85%
10.20%	9.46%	0.74%
1.83%	9.43%	-7.61%
2.58%	9.58%	-7.01%
6.06%	9.55%	-3.48%
18.16%	9.31%	8.85%
15.79%	9.17%	6.62%
10.86%	9.12%	1.74%
7.70%	9.05%	-1.36%
14.61%	8.90%	5.71%
11.83%	8.83%	3.00%
5.11%	8.93%	-3.82%
1.59%	8.97%	-7.37%
9.93%	8.93%	1.00%
11.21%	8.88%	2.33%
14.37%	8.79%	5.58%
19.73%	8.58%	11.15%
15.85%	8.44%	7.41%
14.39%	8.41%	5.98%
11.09%	8.53%	2.56%
12.02%	8.63%	3.39%
8.11%	8.45%	-0.34%
16.02%	8.28%	7.74%
27.88%	8.04%	19.83%
32.07%	7.90%	24.17%

Multiple R 0.1283466

Multiple R 0.1579858

S&P U Annulized Yield	A Annualized Yield	SPA RP
23.73%	7.82%	15.91%
21.55%	7.86%	13.69%
25.41%	7.76%	17.65%
18.85%	7.54%	11.31%
25.54%	7.27%	18.27%
24.38%	7.04%	17.34%
25.29%	7.03%	18.27%
19.12%	7.28%	11.84%
14.39%	7.34%	7.06%
13.44%	7.33%	6.10%
-0.19%	7.45%	-7.64%
-5.27%	7.83%	-13.10%
-2.68%	8.22%	-10.90%
-3.44%	8.33%	-11.77%
-7.52%	8.31%	-15.83%
-6.53%	8.48%	-15.00%
-11.09%	8.41%	-19.50%
-13.18%	8.62%	-21.80%
-12.24%	8.85%	-21.10%
-8.91%	8.98%	-17.89%
-7.95%	8.77%	-16.71%
-1.48%	8.75%	-10.23%
4.28%	8.53%	-4.25%
7.28%	8.37%	-1.09%
8.53%	8.28%	0.25%
15.04%	7.93%	7.11%
15.34%	7.60%	7.74%
14.43%	7.69%	6.75%
17.07%	7.84%	9.24%
27.79%	7.62%	20.17%
29.72%	7.47%	22.25%
33.43%	7.44%	25.99%
42.13%	7.25%	34.88%
33.56%	7.21%	26.36%
28.48%	7.35%	21.13%
26.63%	7.72%	18.91%
23.52%	7.88%	15.63%
19.43%	7.98%	11.45%
23.82%	8.06%	15.76%
13.16%	8.03%	5.13%
13.28%	7.84%	5.44%
7.50%	8.02%	-0.52%
10.33%	7.78%	2.56%
11.15%	7.50%	3.65%
3.18%	7.57%	-4.39%
2.54%	7.77%	-5.23%
5.74%	7.64%	-1.90%
4.68%	7.87%	-3.18%
1.99%	8.04%	-6.05%
6.57%	7.89%	-1.32%
5.53%	7.72%	-2.20%
15.19%	7.49%	7.70%
10.72%	7.50%	3.22%
14.43%	7.47%	6.95%
9.96%	7.36%	2.61%
15.30%	7.25%	8.06%
24.72%	7.16%	17.56%
19.01%	7.05%	11.96%
24.25%	7.12%	17.13%
36.33%	7.16%	29.17%
35.74%	7.16%	28.57%
29.58%	7.16%	22.41%
30.27%	7.04%	23.23%
21.06%	7.02%	14.04%
25.30%	7.00%	18.30%
30.13%	6.94%	23.19%
26.73%	6.96%	19.77%
19.95%	7.04%	12.91%
14.85%	6.91%	7.94%
14.18%	6.97%	7.21%
6.39%	7.08%	-0.68%
-1.50%	7.26%	-8.76%
9.31%	7.21%	2.10%
16.55%	7.46%	9.10%
8.67%	7.73%	0.94%
13.01%	7.70%	5.30%
12.52%	7.91%	4.61%
-1.14%	7.93%	-9.07%
2.11%	8.06%	-5.96%
-7.03%	7.93%	-14.96%
-8.85%	8.12%	-16.97%

Multiple R	0.1283466

Multiple R	0.1579858

S&P U Annulized Yield	A Annualized Yield	SPA RP
5.81%	8.35%	-2.54%
3.46%	8.25%	-4.79%
8.68%	8.29%	0.39%
7.78%	8.28%	-0.50%
6.53%	8.69%	-2.16%
3.85%	8.38%	-4.53%
12.16%	8.26%	3.90%
26.07%	8.13%	17.94%
44.55%	8.22%	36.32%
37.23%	8.14%	29.09%
46.76%	8.13%	38.64%
59.69%	7.86%	51.84%
30.13%	7.80%	22.33%
42.99%	7.74%	35.25%
37.30%	7.67%	29.62%
34.89%	7.92%	26.97%
24.23%	8.00%	16.23%
21.38%	7.86%	13.53%
8.59%	7.79%	0.80%
-7.28%	7.59%	-14.87%
-24.84%	7.71%	-32.54%
-22.19%	7.65%	-29.83%
-25.50%	7.54%	-33.04%
-30.40%	7.83%	-38.23%
-27.30%	7.66%	-34.96%
-31.43%	7.54%	-38.97%
-22.55%	7.74%	-30.30%
-28.22%	7.58%	-35.80%
-32.38%	7.53%	-39.90%
-31.78%	7.42%	-39.20%
-38.44%	7.32%	-45.76%
-34.38%	7.17%	-41.55%
-35.35%	7.09%	-42.44%
-36.36%	7.22%	-43.58%
-30.97%	7.14%	-38.11%
-29.92%	7.08%	-36.99%
-27.89%	7.06%	-34.95%
-29.77%	6.93%	-36.71%
-34.27%	6.80%	-41.06%
-27.20%	6.65%	-33.85%
-11.82%	6.37%	-18.19%
-3.95%	6.21%	-10.15%
4.19%	6.55%	-2.36%
2.43%	6.79%	-4.37%
22.87%	6.58%	16.29%
26.43%	6.42%	20.01%
23.30%	6.37%	16.93%
26.37%	6.28%	20.09%
32.98%	6.15%	26.83%
42.36%	6.15%	36.21%
36.93%	5.97%	30.96%
21.24%	6.33%	14.92%
10.88%	6.62%	4.26%
11.27%	6.47%	4.81%
21.07%	6.27%	14.80%
23.66%	6.15%	17.51%
19.33%	5.98%	13.35%
23.85%	5.99%	17.86%
28.96%	5.96%	23.00%
24.01%	5.93%	18.08%
24.07%	5.79%	18.27%
24.26%	5.61%	18.65%
24.31%	5.83%	18.48%
33.12%	5.65%	27.47%
32.18%	5.54%	26.64%
37.66%	5.40%	32.26%
38.47%	5.50%	32.97%
34.21%	5.51%	28.70%
38.35%	5.50%	32.84%
23.69%	5.77%	17.91%
18.39%	5.88%	12.51%
16.60%	5.82%	10.78%
17.08%	5.75%	11.33%
15.92%	5.82%	10.10%
9.36%	5.98%	3.38%
7.78%	6.29%	1.49%
9.23%	6.42%	2.81%
5.78%	6.40%	-0.62%
8.65%	6.37%	2.28%
10.79%	6.20%	4.59%
4.66%	6.00%	-1.34%

Multiple R	0.1283466

Multiple R	0.1579858

S&P U Annulized Yield	A Annualized Yield	SPA RP
17.79%	5.98%	11.81%
20.78%	5.80%	14.98%
20.88%	5.81%	15.07%
17.64%	5.96%	11.68%
22.40%	5.90%	16.50%
33.66%	5.85%	27.81%
37.15%	5.97%	31.18%
35.92%	5.99%	29.93%
25.99%	6.30%	19.69%
15.59%	6.25%	9.34%
14.90%	6.24%	8.66%
21.07%	6.18%	14.89%
22.52%	6.11%	16.41%
20.36%	5.97%	14.39%
19.28%	6.16%	13.12%
11.28%	6.02%	5.26%
0.65%	6.21%	-5.56%
-1.70%	6.21%	-7.91%
-0.62%	6.29%	-6.91%
2.03%	6.27%	-4.24%
6.54%	6.38%	0.16%
3.73%	6.40%	-2.67%
-0.09%	6.37%	-6.46%
-14.59%	6.49%	-21.08%
-29.35%	7.56%	-36.91%
-27.63%	7.60%	-35.23%
-29.04%	6.54%	-35.58%
-24.20%	6.39%	-30.59%
-30.24%	6.30%	-36.54%
-29.68%	6.42%	-36.10%
-32.79%	6.48%	-39.27%
-32.58%	6.49%	-39.07%
-28.23%	6.20%	-34.43%
-20.45%	5.97%	-26.42%
-18.66%	5.71%	-24.37%
-6.80%	5.53%	-12.33%
2.45%	5.55%	-3.10%
4.21%	5.64%	-1.43%
11.91%	5.79%	6.12%
7.08%	5.77%	1.31%
20.65%	5.87%	14.78%
20.97%	5.84%	15.13%
23.32%	5.81%	17.51%
12.26%	5.50%	6.76%
5.71%	5.46%	0.25%
9.43%	5.26%	4.17%
10.20%	5.01%	5.19%
11.86%	5.01%	6.85%
16.61%	5.10%	11.51%
7.92%	5.37%	2.55%
5.40%	5.56%	-0.16%
12.24%	5.57%	6.67%
15.21%	5.68%	9.53%
12.24%	5.56%	6.68%
13.75%	5.55%	8.20%
23.09%	5.32%	17.77%
23.72%	5.26%	18.46%
13.96%	5.27%	8.69%
14.85%	4.69%	10.16%
11.80%	4.48%	7.32%
14.66%	4.52%	10.14%
19.44%	4.25%	15.19%
19.74%	4.33%	15.41%
14.14%	4.34%	9.80%
13.26%	4.36%	8.90%
14.64%	4.48%	10.16%
12.37%	4.40%	7.97%
10.43%	4.20%	6.23%
15.11%	4.08%	11.03%
19.28%	3.93%	15.35%
11.67%	4.00%	7.67%
12.79%	4.02%	8.77%
10.45%	3.91%	6.54%
4.49%	3.84%	0.65%
1.19%	4.00%	-2.81%
8.34%	4.15%	4.19%
11.63%	4.18%	7.45%
16.06%	4.15%	11.91%
20.35%	4.00%	16.35%
9.33%	4.17%	5.16%
6.22%	4.53%	1.69%

Multiple R	0.1283466

Multiple R	0.1579858

S&P U Annulized Yield	A Annualized Yield	SPA RP
7.26%	4.68%	2.58%
6.67%	4.73%	1.94%
6.51%	4.80%	1.71%
8.66%	4.70%	3.96%
11.68%	4.77%	6.91%
12.40%	4.81%	7.59%
11.64%	4.63%	7.01%
11.60%	4.53%	7.07%
9.45%	4.51%	4.94%
7.76%	4.41%	3.35%
17.12%	4.26%	12.86%
20.99%	4.29%	16.70%
8.58%	4.23%	4.35%
19.95%	4.13%	15.82%
16.46%	4.24%	12.22%
21.23%	4.06%	17.17%
25.18%	4.09%	21.09%
28.58%	3.95%	24.63%
27.98%	3.58%	24.40%
15.99%	3.67%	12.32%
11.66%	3.74%	7.92%
5.72%	3.75%	1.97%
7.53%	4.17%	3.36%
-3.25%	4.39%	-7.64%
8.80%	4.40%	4.40%
-0.45%	4.25%	-4.70%
4.38%	4.39%	-0.01%
-2.32%	4.29%	-6.61%
-5.54%	4.40%	-9.94%
-6.76%	4.35%	-11.11%
-4.40%	4.27%	-8.67%
4.04%	4.11%	-0.07%
13.06%	4.16%	8.90%
11.78%	4.16%	7.62%
12.74%	3.93%	8.81%
29.28%	3.78%	25.50%
22.36%	3.57%	18.79%
20.39%	3.59%	16.80%
17.47%	3.66%	13.81%
17.21%	3.66%	13.55%
13.31%	4.08%	9.23%
16.39%	4.27%	12.12%
12.33%	3.96%	8.37%
15.99%	3.99%	12.00%
10.45%	3.99%	6.46%
14.06%	3.93%	10.13%
17.11%	3.93%	13.18%
5.71%	3.77%	1.94%
9.16%	3.88%	5.28%
19.27%	3.82%	15.45%
15.55%	3.67%	11.88%
19.04%	3.74%	15.30%
29.28%	3.74%	25.54%
15.64%	3.62%	12.02%
10.70%	3.79%	6.91%
1.13%	3.86%	-2.73%
1.90%	4.13%	-2.23%
3.24%	4.17%	-0.93%
-2.07%	4.28%	-6.35%
3.39%	4.27%	-0.88%
2.81%	4.27%	-1.46%
0.71%	4.26%	-3.55%
2.91%	4.26%	-1.35%
0.98%	4.45%	-3.47%
1.77%	4.53%	-2.76%
4.06%	4.53%	-0.47%
12.56%	4.35%	8.21%
21.86%	4.25%	17.61%
20.82%	4.25%	16.57%
19.43%	4.08%	15.35%
19.87%	3.98%	15.89%
20.44%	3.98%	16.46%
17.92%	3.69%	14.23%
22.58%	3.69%	18.89%
28.57%	3.29%	25.28%
25.14%	3.37%	21.77%
18.60%	3.43%	15.17%
27.79%	3.40%	24.39%

Multiple R	0.1283466

Multiple R	0.1579858

SUMMARY OUTPUT

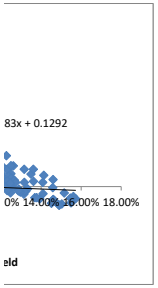
Regression Statistics	
Multiple R	0.1175995
R Square	0.0138296
Adjusted R S	0.0129257
Standard Err	0.2201005
Observations	1093

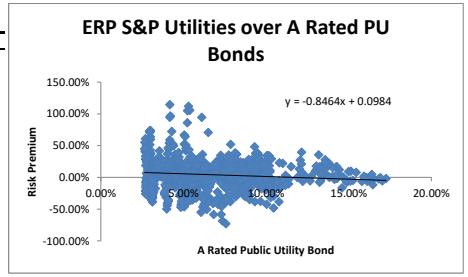
ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.7411834	0.7411834	15.29972299	9.74E-05
Residual	1091	52.852659	0.0484442		
Total	1092	53.593843			

	Coefficients	*tandard Errc*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.0984289	0.0152786	6.4422568	1.76208E-10	0.0684501	0.1284078	0.0684501	0.1284078
X Variable 1	-0.8464329	0.2163968	-3.911486	9.73981E-05	-1.2710338	-0.421832	-1.2710338	-0.421832

Lower 95.0%	*Upper 95.0%*
0.1004142	0.1579842
-1.6221748	-0.7437392





A PU Bond	RP
3.50%	6.88%

Multiple R 0.1175995

Multiple R 0.1175995

Multiple R 0.1175995

Multiple R 0.1175995

Multiple R 0.1175995

Multiple R 0.1175995

Multiple R 0.1175995

Multiple R 0.1175995

Multiple R 0.1175995

Multiple R 0.1175995

Multiple R 0.1175995

Multiple R 0.1175995

Multiple R 0.1175995

Date of Value Line Summary & Index	Est. Median Appreciation Potential 3 - 5 Yrs. Hence	Est. Median Annual Appreciation Potential	Est. Median Dividend Yield	Est. Median Annual Total Return
16-Oct-2020	50%	10.67%	2.30%	12.97%
9-Oct-2020	55%	11.58%	2.30%	13.88%
2-Oct-2020	60%	12.47%	2.40%	14.87%
25-Sep-2020	50%	10.67%	2.30%	12.97%
18-Sep-2020	50%	10.67%	2.30%	12.97%
11-Sep-2020	50%	10.67%	2.20%	12.87%
4-Sep-2020	50%	10.67%	2.20%	12.87%
28-Aug-2020	50%	10.67%	2.20%	12.87%
21-Aug-2020	50%	10.67%	2.20%	12.87%
14-Aug-2020	55%	11.58%	2.30%	13.88%
7-Aug-2020	55%	11.58%	2.30%	13.88%
31-Jul-2020	60%	12.47%	2.40%	14.87%
24-Jul-2020	65%	13.34%	2.40%	15.74%
Average	54%	11.40%	2.29%	13.69%

Blue Chip Financial Forecasts
Consensus Forecast Yield for 30-year Treasury Bonds

			Aaa Bonds	Baa Bonds
Fourth Quarter 2020	1.50	Fourth Quarter 2020	2.3	3.5
First Quarter 2021	1.60	First Quarter 2021	2.4	3.6
Second Quarter 2021	1.60	Second Quarter 2021	2.5	3.6
Third Quarter 2021	1.70	Third Quarter 2021	2.6	3.7
Fourth Quarter 2021	1.80	Fourth Quarter 2021	2.7	3.7
First Quarter 2022	1.90	First Quarter 2022	2.7	3.8
2022-2026	3.00	2022-2026	3.9	5.0
2027-2031	3.80	2027-2031	4.6	5.7
Average	2.11 %	Projected Market Risk Premium 11.58 %	2.96	4.08

Total Projected Return on S&P 500 Based on Value Line	11.84
Average of Value Line MRPs:	11.71
Ibbotson-Based MRPs:	
PRPM Results	10.66
SBBI Common Stocks Total Return - 1926 - 2019	12.10 %
SBBI Long-Term Gov't Bonds Income Return 1926 - 2019	5.09
Historical Market Risk Premium	7.01 %
Regression analysis on SBBI data 1926-2019	10.18
Average of Ibbotson-Based MRPs:	9.28
Total Projected Return on S&P 500 Based on Bloomberg	11.59
Average of Hist'l & Proj'd Market Risk Premium	10.48 %

Source of Information: Value Line Investment Survey
Blue Chip Financial Forecasts October 1, 2020 and June 1, 2020
Stocks, Bonds, Bills, and Inflation - 2020 SBBI Yearbook, Appendix A Tables, John Wiley & Sons, Inc.
Value Line Summary and Index

Proxy Group	VL Beta	CEM Group	VL Beta
AWR	0.65	ADBE	0.85
AWK	0.85	BIO	0.80
CWT	0.65	CASY	0.80
WTRG	0.90	CHRW	0.70
MSEX	0.70	CRM	0.85
SJW	0.80	CSGS	0.75
YORW	0.80	CTXS	0.80
		DG	0.70
		EBF	0.80
		FCFS	0.80
		GIS	0.70
		HTLD	0.75
		JOE	0.85
		LANC	0.65
		LLY	0.75
		MANT	0.85
		MMS	0.80
		SJM	0.65
		SMP	0.80
		TECH	0.80
		TYL	0.80
		WBA	0.80
		WST	0.80

Estimation of Beta by Value Line

The return security i is regressed against the return on the New York Stock Exchange Composite Index in the following form:

$$\ln\left(\frac{p^i_t}{p^i_{t-1}}\right) = \alpha_i + \beta_i \ln\left(\frac{p^m_t}{p^m_{t-1}}\right)$$

where:

p^i_t - The price of security i at time t

p^i_{t-i} - The price of security i one week before time t

p^m_t and p^m_{t-1} are the corresponding values of the New York Stock Exchange Index.

The natural log of the price ratio is used as an approximation of the return and no adjustment is made for dividends paid during the week.

The regression estimate of beta, β_i, is computed from data over the past five years, so that 259 observations of weekly price changes are used.

Value Line adjusts its estimate of beta for regression bind described by Blume (1971). The reported beta is the adjusted beta computed as

Adjusted $\beta_i = 0.35 + 0.67\beta$

M. Blume, "On the assessment of risk," Journal of Finance, March 1971

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BETA, HRA, and CORR Calculation FAQs

This document contains additional explanations about calculations and special data adjustments performed in functions BETA, HRA, and CORR.

The topics covered are:

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1 BETA and HRA

1.1 Linear Regression

This section covers the main calculation formulae used in BETA and HRA.

X = independent variable (price values for security 2)

Y = dependent variable (price values for security 1)

Note: In BETA and HRA, x and y are percentage differences of the value of the securities by default.

$$x_i = \frac{X(i+1) - X(i)}{X(i+1)} \times 100 \ , \qquad y_i = \frac{Y(i+1) - Y(i)}{Y(i+1)} \times 100$$

Raw BETA = $\frac{n\sum xy - \sum x \ \sum y}{n\sum x^2 - \sum x \ \sum x}$

Adjusted BETA = (0.66666 * Raw BETA) + (0.33333 * 1)

ALPHA = $\frac{\sum y - RAW\ BETA \sum x}{n}$

R^2 = $\frac{(n\sum xy - \sum x \ \sum y)^2}{((n\sum y^2 - \sum y \ \sum y) - (n\sum x^2 - \sum x \ \sum x))}$

Standard Deviation Error = $\sqrt{\frac{\sum y^2 - ALPHA \sum y - RAW\ BETA \sum xy}{n-2}}$

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Std Error of Alpha = Standard Deviation Error / AlphaFactor

Where: AlphaFactor = $\sqrt{n - \frac{\sum x \sum x}{\sum x^2}}$

Std Error of Beta = Standard Deviation Error / BetaFactor

Where: BetaFactor = $\sqrt{\sum x^2 - \frac{\sum x \sum x}{n}}$

Number of Points = Number of data points for the calculation
(For percent diff/diff, number of points= n-1,
where n is number of days.)

1.2 BETA +/- Regression

The main formula used for calculating Beta+ and Beta- regression is the following equation:

$$\begin{bmatrix} ALPHA \\ B1 \\ B2 \end{bmatrix} = \text{INVERSE (Z Z') * (Z' Y)}$$

Where: $Y = \begin{bmatrix} y_1 \\ y_2 \\ . \\ . \\ y_n \end{bmatrix}$ $Z = \begin{bmatrix} 1 & x_1 & |x_1| \\ \vdots & \vdots & \vdots \\ 1 & x_n & |x_n| \end{bmatrix}$

BETA+ = B1 + B2

BETA- = B1 – B2

Avg Slope = (BETA+ + BETA-) / 2

Convexity = (BETA+ - BETA-) / 2

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Std Deviation of Error = $\sqrt{\frac{\sum(E^2)}{n}}$

Where: E = $\begin{bmatrix} y_1 & -Alpha & -B1x_1 & -B2|x_1| \\ \vdots & \vdots & \vdots & \vdots \\ y_n & -Alpha & -B1x_n & -B2|x_n| \end{bmatrix}$

R^2 = $1 - \frac{Variance\ (E)}{Variance\ (Y)}$

Where: Variance(y) = $\sqrt{\frac{\sum(Y_i - Avg(y))^2}{n}}$ Variance(E) = $\frac{\sum(E^2)}{n}$

1.3 Adjustment of Missing Points for BETA and HRA

When a data point is missing for one of the securities but not the other (for example due to an exchange holiday), or the same holiday applies to both securities (e.g. Labor Day for IBM US and SPX) the following adjustments are made:

1. The date is ignored if both securities do not have a data point.

2. If “Percent Diff” or ”Diff” is selected as regression in HRA (in BETA it is always “Percent Diff” by default) we adjust the value of the next available point by dividing it with square root of the number of missing points + 1. So if 1 data point is missing it is divided by √2 or if 2 data points are missing then it is divided by √3 and so on. This is done for both securities, including the one that had a data point for the date that was dropped.

   For example, the table below contains data for 3 days for a security A. The adjustment done when percent diff is used to calculate BETA is shown below. Note that it does not matter if the second security had data on 10/23/2008 and 10/24/2008 – the same adjustments will be made to it as well.

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Date	Close Price	% Diff
10/22/2008	14.51	
10/23/2008	(missing / no data)	(no data)
10/24/2008	(missing / no data)	(no data)
10/25/2008	14.76	= (14.76 /14.51 – 1) * 100 / SQRT(3)

See the sheet BETA in the Excel spreadsheet Beta_CORR_Worksheet.xls. {IDOC # 2055466}.

1.4 Origin of the Adjusted BETA Formula

The formula for adjusted beta is based on Blume's equation (Betas and their regression tendencies, 1975). The adjusted beta formula assumes that beta moves towards the market mean, which is 1.

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2 CORR

2.1 Calculations

X = independent variable (price values for security 2 – could be adjusted)

Y = dependent variable (price values for security 1 – could be adjusted)

Covariance = $\frac{\sum xy}{n}$

BETA = $\frac{\sum xy}{(n-1)*\sqrt{\frac{\sum x^2}{n-1}}*\sqrt{\frac{\sum x^2}{n-1}}}$

ALPHA = Y' – BETA X'

R^2 = $\left(\frac{Covariance * n}{(n-1)*\sqrt{\frac{\sum y^2}{n-1}}*\sqrt{\frac{\sum x^2}{n-1}}}\right)^2$

Residuals = $\sum y^2 * (1 - R^2)$

Number of Points = Number of data points for the calculation
(For percent diff/diff, number of points= n-1,
where n is number of days.)

2.2 Adjustment of Missing Points for CORR

See section 1.3 Adjustment of Missing Points for BETA and HRA in this document. The same adjustments are applied in CORR.

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2.3 CORR Order of Operations

CORR allows the user to apply various transformations on the price data for securities. This can be done per security from the Edit screen. The order in which these transformations are applied can greatly affect the calculated results. The correct order in which the transformations should be applied is:

a) Obtain Price of the security with Lag (if applicable).

b) Apply Simple moving Average (if applicable).

c) Apply Log (if applicable).

d) Apply percentage difference/difference (if applicable).

e) Data adjustment for missing values (see section 2.2).

Please note that any attempt to manually match the data in an Excel spreadsheet with the CORR results should take this operation order into account. Otherwise, the results will not match CORR results.

See the sheet CORR in the Excel spreadsheet Beta_CORR_Worksheet.xls {IDOC # 2055466}.

2.4 Differences between CORR and HS

While the basic correlation calculation is the same for both CORR and HS with identical settings, there are a few differences:

a) Period of Correlation

HS uses a rolling correlation period to plot the correlation curve, while CORR calculates a single correlation value using all the data from the given date range. In the case of HS, the period of correlation can be changed on the Edit Page. The default value for this is normally 120. Each correlation value on the chart is calculated using the number of previous data points as specified by this period.

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In CORR, however, the period depends on the date ranges and the numeric value of the period used can be seen by clicking on the specific value in the correlation matrix. If this "period" in CORR does not match the correlation value in HS, the final results will be quite different.

b) Overrides

CORR offers more overrides and adjustment options than HS for calculation the correlation value as listed in section 2.3 of this document. HS only offers the choice between correlating the raw values or the percent differences. Make sure no other overrides and adjustments are used in CORR when comparing the result between CORR and HS.

c) Adjustment for Missing Data Points

In HS if a data point is missing for a security, the value from the previous day is carried forward. The correlation is calculated based on these carried forward values. In CORR the adjustment is made as explained in section 1.3 of this document. This will often lead to slight differences in the result assuming all other properties match.

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3 Importing Data to Microsoft Excel

The first step toward comparing the calculations in an Excel spreadsheet and the calculations in BETA, HRA or CORR is to verify that the data used in the functions match the data in the spreadsheet. The best way to confirm that is to populate the spreadsheet using the Excel API by following these steps:

a) Click on “Import Data” on the Bloomberg Tab in Excel.
b) Choose “Historical End of Day” as data type.
c) Add the securities.
d) Choose the appropriate price field.
e) Choose the date range for which data is required.
f) Choose “Include all non-trading weekdays” option.
g) Choose “Blank” as the value for the option “Filler value non trading periods.”
h) Choose “Yes” as the value for the option “Follow DPDF Settings.”

4 Comparing BETA with FLDS and Excel

Calculations in BETA/CORR/HRA are often compared with calculations in FLDS or through the API in Microsoft Excel. The calculations should match in most cases. However they may differ due to difference in following settings:

a) GFUT settings: If one of the securities is a Future, Excel/FLDS may ignore the GFUT settings and use the “Bloomberg default” value for the Price option. BETA/HRA/CORR take GFUT settings into consideration and the underlying price data therefore may be different, leading to different results.

b) IDEF settings: If one of the securities is an Index, Excel/FLDS may ignore the IDEF settings and use the “Close/Sett(4)” property for the Value option. BETA/HRA/CORR take IDEF settings into consideration and the underlying price data therefore may be different, leading to different results.

REQUEST: **Regression-Based Equity and Market Risk Premium Models**: A regression model is used to estimate various risk premia in the total market approach RPM and CAPM:

- Large company common stocks relative to Moody's average Aaa and Aa rated corporate (DWD-4, p. 9).
- S&P Utility Index relative to Moody's A2 rated public utility bond yields (DWD-4, p. 12).
- Large company common stocks relative to Ibbotson long-term government bond yields (DWD-5, p. 2).

a. Please explain the rationale for comparing *trailing* one-year equity returns to monthly-average *forward-looking* long-term bond yields.
   i. Conceptually, how does the average of forward-looking bond yields in any given month influence equity returns over the preceding twelve months?
   ii. What relationship would we expect to see between returns evaluated over two different time periods, one backward-looking, the other forward-looking, that are mostly non-overlapping in time?
   iii. How does this relationship relate to our task of estimating a *forward-looking* equity return?

b. How should the statistical validity of these three regressions be assessed, e.g., R^2, regression coefficient t-statistics, etc.?[1]

c. Please provide any academic papers, textbook passages, or other research or analysis investigating the theoretical and empirical validity of estimating risk premia from a linear regression model of trailing equity returns relative to forward-looking long-term bond yields.

RESPONSE:

a. Mr. D'Ascendis does not agree with the premise of the question. Historical bond yields are historical measures, not forward-looking ones.
   i. Mr. D'Ascendis' regression analysis shows the relationship between historical interest rates and historical equity risk premiums. As shown in Mr. D'Ascendis' workpapers, there is a statistically

[1] Note that, because the dependent variable (risk premium, or equity return – 1 x bond yield) is a linear function of the dependent variable (bond yield), the regression slope coefficient's t-statistic (measure of statistical significance) should be based on its difference from -1, not 0.

significant negative relationship between interest rates and equity risk premiums.

ii. Mr. D'Ascendis has not made such a study.

iii. Please see Mr. D'Ascendis' response to part ii, above.

b. The t-statistic and the p-value.

c. As stated above, historical bond yields are not forward-looking measures.