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The Utility of Finance

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Abstract: Public Utilities Commissions (PUCs) are charged with regulating a utility's rates to prevent monopoly pricing subject to the constraint that the utility's investors earn a rate of return commensurate with that expected by businesses facing similar risks. Although the task of assessing risk-adjusted returns is a staple of modern finance, we know surprisingly little about how well PUCs accomplish their regulatory mandate when judged against standard benchmarks of financial economics. This article analyzes a dozen years' worth of gas and electric rate-setting decisions from PUCs across the United States and Canada, demonstrating empirically that allowed returns on equity diverge significantly and systematically from the predictions of accepted asset pricing methodologies in finance. Our analysis suggests that current regulatory practice more plausibly reflects an amalgam of other non-finance desiderata, including political goals, incentive provision, regulatory capture and lack of financial valuation expertise among regulators. We also present evidence based on a unique field experiment suggesting that training in finance can partially ameliorate the divergence between PUC rate setting and financial methodologies.

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I. Introduction

During the last three decades, a significant transformation has been underway in regulatory areas where time and risk valuation affect legal outcomes: The emergence and growth of the centrality of financial valuation methodologies to inform legal outcomes. While such approaches were generally foreign to legal and regulatory decision-making in the early 1980s, corporate finance now permeates a vast and growing set of doctrinal areas, ranging from securities fraud, to corporate law, to bankruptcy to tax, to mergers and acquisitions.[1]

Among this burgeoning set of applications, the advance of finance into regulation of public utilities was perhaps *particularly* inevitable. Indeed, the challenge of scrutinizing rates of return has long been a key element of utilities regulation, reflecting an expansive conception of necessary state and federal regulatory power over the actions of natural monopolies, often with important economic implications in play.[2] As is well known, the legal governance of public utilities is designed to ensure that the utility provides critical services to the public at reasonable costs, and to protect consumers against bargaining inequalities, informational disadvantage, collusive pricing, and market inefficiency due to the public's dependency on the continuous provision of public necessity. At the same time, for both legal and practical reasons, regulators must also allow utilities' capital providers to recoup a competitive rate of return on their investments. Accordingly, public utility commissions (PUCs) are vested with power to supervise, administer and regulate the economic activities of utilities, all in the name of striking this balance.

A key component of the utilities regulation process thus pertains to the challenge of pegging rates and prices at levels that yield an appropriate risk-adjusted return for utilities' capital investors. This mandate goes back a full century (at least), and is reflected in the oft-repeated edict from the 1923 United States Supreme Court opinion in *Bluefield Waterworks v. Public Service Commission* :

[1] See generally Roberta Romano, *After the Revolution in Corporate Law*, 55(3) JOURNAL OF LEGAL EDUCATION (September 2005). For specific doctrinal applications of outside of the utilities regulation context, see Kenneth Ayotte & Edward Morrison, "Valuation Disputes in Corporate Bankruptcy" (applying to bankruptcy proceedings) (unpublished manuscript, 2017); Eric Talley, "Finance in the Courtroom: Appraising Its Growing Pains," DELAWARE LAWYER 16 (applying to corporate and shareholder appraisal proceedings) (August 2017).
[2] William J. Novak, *The Public Utility Idea and the Origins of Modern Business Regulation*, in CORPORATIONS AND AMERICAN DEMOCRACY 139-159 (Naomi R. Lamoreaux and Willian J. Novak, eds., 2017).

> 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.[3]

It was not until decades after *Bluefield*, however, that advances in financial economics made it practically possible to address the above mandate formally, using a variety of asset-pricing methodologies. A prime example of such methodological approaches is the Capital Asset Pricing Model—or CAPM—one of a host of now well-accepted approaches for determining how to adjust expected rates of return for anticipated risks.[4]

Yet, to what extent do rate regulators render decisions that comport with standard financial methodology in their decision-making process? This paper offers an empirical analysis of rate awarded by public utility commissions (PUCs), evaluating their relationship to factors that standard finance theory predicts would drive expected returns for capital investors. We analyze data of nearly a thousand PUCs gas and electric rate-setting decisions over a twelve-year period (2005-2016) emanating from PUCs across the United States and Canada. Our benchmark for analysis is the lens of accepted asset-pricing theories from financial economics. We inquire whether awarded rates of return for public utilities are set in a manner consistent with calibrating awarded returns against investment risk. In particular, we assess whether awarded rates of return track those prescribed for individual utilities according to the CAPM, the still-dominant model for quantifying risk and translating it to assessment of expected returns of equity.[5]

Our analysis strongly rejects the hypothesis above with significant confidence: specifically, we demonstrate that rate setting practices diverge appreciably from the predictions of financial economics across numerous dimensions. For example, awarded gross returns on equity (ROEs) tend to exhibit considerable stickiness around focal "odometer" points (particularly a flat 10%) regardless of the cyclical structure of other prevailing benchmark rates.

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[3] Bluefield Waterworks v. Public Service Comm'n, 262 U.S. 679 (1923). Accord FPC v. Hope Natural Gas Company, 320 U.S. 591 (1944) ("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").

[4] DAVID G. LUENBERGER, INVESTMENT SCIENCE (1998).

[5] IVO WELCH, THE CAPITAL ASSET PRICING MODEL, IN CORPORATE FINANCE, Chapter 10, 213 (2017).

Moreover, awarded ROE spreads over risk free treasuries have progressively *widened* significantly since 2005, even though systematic risk in the utilities industry has *fallen continuously* during the same period. Indeed, if the awarded ROEs were an asset class, they would generate a mean positive abnormal return ("alpha") of *between 7.5 and 8.5 percent*, an amount that overshadows even the performance of Fortune Magazine's top twenty stock investments for the last decade.[6] Finally, as anticipated market returns (i.e., systematic risk) have fluctuated during the period studied, awarded ROE spreads have consistently (and curiously) moved in the *opposite* direction, notwithstanding the fact that market returns on utilities' equity overwhelmingly have positive betas. Our analysis thus confidently rejects the hypothesis that awarded ROEs behave anywhere near what finance theory predicts would be the expected return of a commensurably risky investment.

What, then, explains the extreme deviation from standard finance theory's predictions? Although we cannot make definitive conclusions here, we tentatively identify a host of factors that may be at play, including the possibility that regulators' behavior reflects political patronage concerns, dynamic incentive provision, regulatory capture, and a simple lack of expertise in finance. We find, for example, evidence that the structural composition of the PUC is reflected in awarded ROEs: the percent of the commission that is elected predicts lower awarded ROEs, with completely elected commission tending to award significantly *lower* returns on equity (over 100 BPs lower) than completely appointed ones. This effect arguably represents the electoral costs that commissioners pay with rate payers when they rates too high, and/or the greater impediments to long term incentive provision and/or regulatory capture among elected commissions. (Neither elected nor appointed commissions, however, issue rates that comport particularly well with the CAPM.)

Higher awarded rates may also aim to sustain an equity cushion designed to improve utilities' incentives for reliability (and possibly safety).[7] "Inventorying" power is still beyond the capacity of most generators. Sustaining the continuous and uninterrupted electricity service therefore requires maintenance of continuous and almost instantaneous balance between

[6] See Reviewing Fortune's 20 'Best Investments' Of The Last Decade, Seeking Alpha (9/22/2016, available at https://seekingalpha.com/article/4007867-reviewing-fortunes-20-best-investments-last-decade) (a gross annualized return of 8.1%).

[7] Paul Joskow and Jean Tirole, *Reliability and Competitive Electricity Markets*, 38(1) RAND JOURNAL OF ECONOMICS 60-84, 78 (2007).

production and consumption of electricity in power systems.[8] On certain occasions (such as the Super Bowl), utilities can expect the spike in demand, but not all spikes and dips can be foreseen. To mitigate the risk of power shortages and blackouts, some margin of excess generation capacity above the expected demand load must be kept at all times. Higher awarded rates can sustain investments in excess capacity and may theoretically enhance the reliability of energy provision in the light of the volatility of capital expenditures and the lack of technical storage feasibility.

Another hypothesis is that regulators aim to sustain the financial stability of utilities via rate making, so as to reduce the likelihood of a bailout or a subsidy following financial distress. As utilities are "too important to fail SINFIs, exclusively providing social necessities,[9] rate regulation may implicitly function as micro-prudential regulation for public utilities, using the equity cushion to mitigate the risk of insolvency and illiquidity. The prioritization of such other goals may provide a cogent account for why PUCs appear to veer so far from accurate calibration of risk-adjusted returns.

Alternatively, regulators may place significant weight on the consistency and predictability of awarded rates, independent of systematic risk dynamics. Indeed, the dominant approach for risk-return calibration among regulators tends not to be CAPM, but rather a simplified application of the Gordon dividend growth model (often referred to by regulators—somewhat misleadingly—as the Discounted Cash Flow or "DCF" approach[10]). This methodology—which is specifically endorsed by FERC and many other state regulators, has substantially fewer moving parts than CAPM (limited generally to price, expected dividends and perpetuity growth rates). Consequently, before submitting a request for a rate increase, a utility may be better able to predict the outcome with greater certainty, allowing it to plan its rate increase requests strategically (e.g. to avoid requests during a sensitive election cycle or

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[8] Jose Fernando Prada, *The Value of Reliability in Power Systems – Pricing Operating Reserves* (Massachusetts Institute of Technology, Energy Laboratory, Working Paper, 1999); RICHARD BROWN, ELECTRIC POWER DISTRIBUTION 15, 143 (2009).

[9] Shlomit Azgad-Tromer, *Too Important to Fail: Bankruptcy versus Bailout of Socially Important Non-Financial Institutions*, 7(1) HARVARD BUSINESS LAW REVIEW 160 (2017).

[10] To non-utilities-oriented finance professionals, DCF analysis refers to the estimation of fair-market value for an entire company or its equity, a task that rates of rates of return (however computed) as inputs. As used among utilities regulators, however, DCF means something different, and describes the practice of imputing risk-adjusted returns from observed prices using the Gordon dividend growth model.

economic downturns). Through delivering a more predictable result, however, the (so-called) DCF approach can often diverge from CAPM (and other more foundational asset pricing models), a factor that may permit regulators to commit credibly to stable investment returns ex-ante (even if inconsistent with their putative regulatory mandate)..[11]

A final hypothesis that could be driving *at least part* of the behavior we observe is that risk valuation can place appreciable technical demands on regulators and staffs that are outside their areas of expertise. To the extent an expertise gap exists, it may be addressable through greater financial economics training of commissioners and regulatory staffs. To test this conjecture, we exploit data from a unique field experiment that exposed state-level PUC commissioners and staffs to immersion training in asset pricing and finance (and particularly the CAPM). We find evidence that among treated PUCs, finance training *does* appear to dampen the divergence between post-training rate setting and the predictions of finance. The effects are relatively modest, however, perhaps due to the limited (one day) nature of the training program. Nevertheless, our findings suggest that at least some of the behavior we observe is due to a lack of expertise among decision makers, and that it may be possible to address that expertise gap programmatically. .

Our analysis proceeds as follows. In Section II, we provide a high-level overview of the rate-setting process, and its criticality to utility profitability and solvency. There we provide a brief overview of some details in formulating the weighted average cost of capital, an all-things-considered rate of return that combines tax rates, leverage levels, returns on debt and the all-important return on equity (ROE). We demonstrate how critical (and contentious) ROE determinations are to the overall process, and describe prevailing methodologies used by PUCs to set it. Section III describes our data and presents a series of tests of hypothesis that ROE

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[11] Identified by Coase in 1972, the commitment problems and time-inconsistency reflect the risk of under-investment due to uncertainty. When rates are regulated, investors risk the possibility that the regulator would adjudicate a lower rate of return after the investments are absorbed in the corporation or project, expropriating their sunk investments. The expected equilibrium is under-investment, resulting in imminent public infrastructure meltdowns due to backed up maintenance and repair. Predictable rate setting methodology allows the regulator to commit to a fair return on irreversible investments ex ante. Ronald H. Coase, *Durability and Monopoly*, 15 JOURNAL OF LAW AND ECONOMICS 143 (1972); Glenn Blackmon and Richard Zeckhauser, *Fragile Commitments and the Regulatory Process*, 9 YALE JOURNAL ON REGULATION 73 (1992); David P. Baron and David Besanko, C*ommitment and Fairness in a Dynamic Regulatory Relationship*, 54 REVIEW OF ECONOMIC STUDIES 413-436 (1987); Gregory Lewis and Patrick Bajari, *Moral Hazard, Incentive Contracts and Risk: Evidence from Procurement*, 81 REVIEW OF ECONOMICS STUDIES, 1201-1228 (2014).

determinations mimic the pricing of risk, all of which are rejected. There we also explore other empirical factors that have some predictive power, and demonstrate the effect of finance training in substantially counteracting the inconsistencies between rate setting and asset pricing predictions. Section IV concludes.

II. Overview of the Regulatory Rate-Setting Process

Public utilities are widely considered natural monopolies, and regulation is designed to mitigate the potential welfare costs of market power, so that monopoly prices do not transfer greater than normal economic rents the consumers to the stockholders of the firm.[12] The welfare loss from the self-rationed production of the monopoly is often called "the deadweight costs" of monopoly, as some consumers who would have purchased at the competitive price are restricted from purchase, resulting in welfare loss.[13] Vulnerability to the exercise of market power is the primary justification for rate regulation.[14] While monopoly power can always visit deadweight losses on any market, the energy sector carries significant negative externalities with distributional consequences. Because utilities provide public necessities, and can be conceptualized as geographical franchises for energy provision, consumers' disadvantage, imposition, unreasonable charges, harmful prices, and harmful standards of service are also well recognized regulatory concerns.[15]

Prices and rates charged by electric and gas utilities are regulated in the United States by targeting (either explicitly or implicitly) market rate of return for a utility's investors (and particularly its equity holders).[16] The authority for rate regulation is divided between the federal government and the states, in which Federal Energy Regulatory Commission (FERC) holds the

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12 See Richard A. Posner, *The Social Costs of Monopoly and Regulation*, 83 J. POL. ECON. 807, 810 (1975); Gordon Tullock, *The Welfare Costs of Tariffs, monopolies and Theft*, 5 W. ECON. J. 224, 225-26 (1967).
13 *Id.*
14 Severin Borenstein, *The Trouble With Electricity Markets: Understanding California's Restructuring Disaster*, 16(1) THE JOURNAL OF ECONOMIC PERSPECTIVES 191-211 (2002); Erin T. Mansur, Pricing Behavior in the Initial Sumer of the Restructured PJM Wholesale Electricity Market. 90(2) THE REVIEW OF ECONOMIC AND STATISTICS 369-386 (2008); Ali Hortacsu and Steven L. Puller, *Understanding Strategic Bidding in Multi-Unit Auctions: A Case Study of the Texas Electricity Spot Market*, 39(1) THE RAND JOURNAL OF ECONOMICS 86-114 (2008).
15 See William J. Novak, supra note 2 id, at 158-159, arguing that "Monopoly was just one of many other important factors driving the public utility idea".
16 IRSTON R. BARNES, THE ECONOMICS OF PUBLIC UTILITY REGULATION (1942). Rate-making is a kind of price-fixing: see Munn v. Illinois, 94 U.S. 3, 134 (1877).

jurisdiction over the interstate aspects of power and electricity, while the states largely retain jurisdiction for intrastate matters, including, most notably, retail sale[17.] There are therefore two arenas for rate-setting cases: (a) the FERC for utilities providing interstate power infrastructure; and (b) the state-based public utility commissions for utilities providing retail intrastate power service. In either case, however, a foundational principle that guides regulation of rates in both jurisdictions is that prices should reflect the "cost of service"[18] adjusted to deliver a fair, risk-adjusted rate of return for capital investors.

Consequently, regulators are required to deduce/compute the utility's rate of return, which is typically embodied in the utility's Weighted Average Cost of Capital (WACC)—essentially a tax-adjusted weighted average cost of debt and the expected return of preferred and common stock that a utility has issued to finance its investments. For a utility with a single class of debt and a single class of equity, the WACC is expressed as follows:

$$\text{WACC} = \left(\frac{Debt}{Debt + Equity}\right) \cdot (1 - \tau) \cdot \text{ROD} + \left(\frac{Equity}{Debt + Equity}\right) \cdot \text{ROE}, \tag{1}$$

where *Debt* and *Equity* denote the fair market value of the utility's outstanding debt and equity ownership claims, τ denotes the utility's marginal tax rate, and *ROD* and *ROE* denote the returns on debt and equity (respectively) demanded by capital investors. (The inclusion of the $(1 - \tau)$ term on the debt component reflects the fact that interest payments are made on a pre-tax basis, and thus are partially subsidized by the tax authorities.)

In computing the WACC, market values for debt and equity, as well as the utility's marginal tax rate are generally straightforward to observe. [19] The return on debt is similarly often straightforward, since the utilities debt instruments / lines of credit specifically note it. But how much should electric and gas utility stockholders earn? The somewhat unhelpful statutory

[17] See Federal Power Commission v. South Cal. Edison Co., 376 U.S. 205, 215-16 (1964); Miss. Power & Light Co. v. Mississippi ex rel. Moore, 487 U.S. 354, 388 (1988); FERC v. Electric Power Supply Association, 136 S. Ct. 760 (2016).

[18] I.A. KAHN, THE ECONOMICS OF REGULATION 26-27 (1970); Dr. Karl McDermott, Cost of Service Regulation in the Investor-Owned Electric Utility Industry: A History of Adaptation, Edison Electric Institute Working Paper (June 2012).

[19] One caveat is that many utilities operate as subsidiaries of larger (often inter-state) utilities, a factor that can complicate both our and regulators' analysis, as discussed below. In such cases, apportioning market values of debt and equity between affiliates can be difficult.

standard running as a scarlet thread throughout energy legislation determines the rates charged by a utility provider should be "just and reasonable"[20]. But what exactly does that mean?

As interpreted by the Supreme Court, the fixing of "just and reasonable" rates involves assessing a return on equity as will permit the utility's equity investors to earn a return commensurate with investors in comparators that face corresponding risks and uncertainties[21]. A "just and reasonable" rate should be reasonably sufficient to assure confidence in the financial soundness of the utility, and should be adequate to maintain and support its credit and enable it to raise the money necessary for its continued operation[22]. Investors' confidence and capital attractiveness are particularly salient for utilities because utilities in financial distress are likely to be sponsored, subsidized or bailed-out by taxpayers due to their unique position as situational monopolies providing of essential services.[23] An operating failure of the public utility, whether due to illiquidity, insolvency, or simple shortage of power supply, is expected to induce a public crisis of confidence, as the social and economic infrastructure of our lives is a based on an implied assumption of continuous and uninterrupted electricity provision.

The statutory mandate to regulate a public utility's ROEs to a just and reasonable level leaves rate regulators in somewhat of a methodological No Man's Land. State public utility commissions are generally free to establish their own methodologies in rate setting procedures. Perhaps due to its ease of use and comprehension by regulators not necessarily particularly vested in financial theories, the most popular method used to determine the ROE among state

[20] Under the Federal Power Act all rates and charges made, demanded, or received by any public utility for or in connection with interstate wholesale sales shall be "just and reasonable"; so too all rules and regulations affecting or pertaining to such rates or charges: 16 U.S.C.S. § 824(b)(1); 16 U.S. C.S. § 824d(a). If the FERC sees a violation of that standard, it must determine the just and reasonable rate and impose it by order: 16 U.S.C.S. § 824e(a). Similarly, many state public utility statues contain provisions permitting commission authorizations to regulate "just and reasonable rates". See for example AL Code § 37-1-80 (2013) requiring that "the rates for the services rendered and required shall be reasonable and just to both the utility and the public. Every utility shall be entitled to such just and reasonable rates as will enable it at all times to fully perform its duties to the public, and will, under honest, efficient and economical management, earn a fair net return on the reasonable value of its property devoted to the public's service".

[21] Bluefield Water Works & Improvement Company v. Public Service Commission of the State of West Virginia et al., 262 U.S. 679 (1922), reasoning that "Rates which ae not sufficient to yield a reasonable return on the value of the property used… are unjust, unreasonable and confiscatory, and their enforcement deprives the public utility company of its property, in violation of the Fourteenth Amendment".

[22] *Id*, p. 692.

[23] Shlomit Azgad-Tromer, Too Important to Fail, supra note 9 id.

public utility commissions is what they (but few others) refer to as the discounted cash-flow (DCF) approach,[24] which is a variant on the Gordon Dividend-Growth model and conceives of the price of a stock to be present discounted value of its future perpetual dividend stream. The FERC has officially adopted a variant of the DCF as its preferred method for ROE computation (setting a benchmark that is emulated loosely by many state regulators[25]). This approach is based on an underlying premise that an equity investment is worth the present discounted value of its future stream of dividends, discounted at the appropriate risk-adjusted rate, as reflected in the "growing perpetuity" expression:[26]

$$P_0 = \frac{D}{\mathrm{ROE} - \mathrm{E(g)}}, \tag{2}$$

where P_0 is the observed price of the common stock during the regulatory testing period, D is the current dividend, and $\mathrm{E(g)}$ is the expected perpetual growth rate of dividends.

Rearranged to solve for the required rate of return, the ROE can be expressed as:

$$\mathrm{ROE} = \frac{D}{P_0} + \mathrm{E(g)}. \tag{3}$$

Under the FERC's approach, this expression is slightly modified to read:

$$\mathrm{ROE} = \frac{D \cdot (1 + \theta \cdot \mathrm{E(g)})}{P_0} + \mathrm{E(g)}, \tag{3'}$$

where θ is an adjustment factor intended to approximate the effect of the periodicity of "lumpy" dividend payments.[27] As many of the utility providers are public corporations, the price of their common stock and their dividend yield component are in the public domain[28].

[24] Kenneth Gordon and Jeff D. Makholm, *Allowed Return on Equity in Canada and the United States: An Economic, Financial and Institutional Analysis*, NERA Economic Consulting Working Paper 20 (2008). It bears noting that what the PUC utilities community refers to as a DCF approach is somewhat more specialized than what finance practitoners think of it as entailing. Because this paper is about utilities regulation, however, we adhere to that industry's nomenclature.

[25] [Cite]

[26] The FERC has adopted DCF as its main methodology for analyses of required rate of return in the 1970's. See, e.g., Minn. Power and Light Co., 3 FERC 61,045 at 61, 132-22 (1978).

[27] Under the FERC's approach, θ is pegged at 0.5, so that the dividend yield is multiplied by the expression (1+.5E(g)), an adjustment meant to account (somewhat imprecisely) for the fact that dividends are usually paid on a quarterly basis. Multiplying the dividend yield in this manner results in what the FERC refers to as the "adjusted dividend yield". See Massachusetts Attorney General et al. v. Bangor Hydro-Electric Company et al., 147 FERC 61, 234 (2014).

To compute the constant dividend growth rate *E(g)*, the FERC uses a two-step procedure, averaging short-term and long-term growth estimates.[29] The Institutional Brokers Estimate System (IBES)'s five-year forecast for each company in the proxy group, is used to determine the expected growth for the short term[30]. The long-term growth rate—which is almost always lower—is based on forecasts of long-term growth of the economy as a whole, as reflected in GDP: public utilities are assumed to sustain long term growth consistent with the growth of the economy as a whole.[31] The practice endorsed by the FERC to compute the anticipated perpetuity growth rate is to accord the short-term forecast receives a two-thirds weighting and the long-term forecast receives a one-third weighting.[32] We note that when (i) the short-term rate exceeds the long-term rate (as it often does), and (ii) the long term rate is pegged around the expected long-term growth rate for the entire economy (as it usually is), the aggregated perpetuity growth rate under FERC's approach will also exceed the long-term growth rate for the entire economy. Although such assumptions lead to absurd results,[33] utilities regulators have long retained them.

The two-step DCF methodology is purportedly used by the FERC to establish a "zone of reasonableness" for ROEs. Yet, an ROE may be both within the realm of reasonableness and be considered unjust and unreasonable: in other words, not all ROEs within the purported "zone" are truly just and reasonable[34]. To inform the just and reasonable placement of the ROE within the zone of reasonableness, the FERC uses a variety of alternative risk-pricing approaches, such

[28] For the dividend yield component, the FERC uses a single, average dividend yield based on the indicated dividend and the average of the monthly high and low stock prices over a six-month period. See e.g., *Portland Natural Gas Transmission Sys*., Opinion No. 510, 13 FERC 61, 129, at pp 232-234 (2011).
[29] Massachusetts Attorney General et al. v. Bangor Hydro-Electric Company et al, supra note 27 *id*, p. 10.
[30] Earnings forecasts made by investment analysts are considered the best estimate of short-term dividend growth because they are likely relied on by investors when making their investment decisions. See Transcon. Gas Pipe Line Corp., Opinion No. 414-B, 85 FERC 61, 323, at 62,269 & n. 34 (1998).
[31] Opinion No. 396-B, 79 FERC at 62, 382-82; Opinion No, 396-C, 81 FERC 61, 036 (1997), cited at Massachusetts Attorney General et al. v. Bangor Hydro-Electric Company et al, supra note 27 *id*, p. 12. Up until the Bangor Hydro opinion in 2014, the FERC used a one-step DCF methodology for utility providers, which lacked a long-term growth projection.
[32] "Given the greater reliability of the short term projection, we believe it is appropriate to give it greater weight" – see Opinion No. 414-A, 84 FERC at 61, 423-24. The United States Court of Appeals for the District of Columbia Circuit (D.C. Circuit) affirmed this two thirds/one third weighting for determine the overall dividend growth estimate at CAPP v. FERC, 254 F. 3d at 297 (2001).
[33] As several commentators point out, if an assumed perpetuity growth rate for the company exceeds the long term growth rate of the economy, then in the limit the company will eventually come to dominate the entire economy. See, e.g., R. Scott Widen, *Delaware Law, Financial Theory and Investment Banking Valuation Practice*, 4 NYU Journal of Law and Business 578 (2010).
[34] Association of Business Advocating Tariff Equity et al. v. Midcontinent Independent System et al., 156 FERC 61060, 8 (2016); So. Cal. Edison v. FERC, 717 F. 3d at 181-82 (2013).

as the CAPM (discussed below), risk-premium buildup benchmarking, and expected earnings analysis[35]. In addition, record evidence of state commission-approved ROEs is taken into account, and although not used directly to establish utilities' ROEs[36], state commission ROEs do serve as an indicator for an adjustment within the zone of reasonableness to satisfy the level sufficient to attract investment[37].

Although evidently well accepted among utilities regulators, for a variety of reasons (some noted above), the so-called DCF approach is not widely followed by financial professionals outside of the utilities context, the academic literature, or many other legal actors charged with risk pricing. For example, most recent Delaware courts opinions in appraisal matters underlying fairness opinions[38] rely much more centrally on the Capital Asset Pricing Model (CAPM)[39] or (to a lesser extent) the Fama-French three-factor model[40] as the preferred methods for estimation of the company's cost of capital[41]. The popularity of CAPM with finance professionals is based on its assessment of the relationship of investments with risk[42]. The basic intuition that underlies CAPM is that returns and risk go together like a horse and carriage:

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[35] ROGER A. MORIN, NEW REGULATORY FINANCE 108 (2006). Interestingly, utilities regulators have not generally attempted to impute rates of return through comparable company / transaction analysis.

[36] "State commission ROEs are established at different times in different jurisdictions which use different policies, standards and methodologies in setting rates" – see Middle South Services, Inc., Opinion No. 12, 16 FERC 61,101, at 61,221 (1981); see also: Boston Edison Co., Opinion No. 411, 77 FERC 61,272 at 62,171-62,172 (1996): ; Jersey Cent. Power & Light Co., Opinion No. 408, 77 FERC at 61, 002.

[37] Bangor Hydro-Electric Company et al, supra note 27 *id*, p 72: "we are faced with circumstances under which the midpoint of the zone of reasonableness established… has fallen below state commission approved ROEs, even though transmission entails unique risks that state-regulated electric distribution does not… the discrepancy between state ROEs and the… midpoint serves as an indicator that an upward adjustment is necessary to satisfy *Hope* and *Bluefield*".

[38] Under 8.Del.C. § 262(h), upon finding that a stockholder is entitled to an appraisal, the court must determine the fair value of the shares exclusive of any element of value arising from the accomplishment of the proposed transaction. R. Scott Widen, *Delaware Law, Financial Theory and Investment Banking Valuation Practice*, 4 NYU Journal of Law and Business 578 (2010); Gaurav Jetley and Xinyu Ji, *Appraisal Arbitrage – Is There a Delaware Advantage?* 71 The Business Lawyer 427 (2016).

[39] See TIM KOTLER, MARC GOEDHART AND DAVID WESSELS, VALUATION 293-315 (2005). Formulaically, the CAPM posits that an asset's expected return, $E(R_A)$ is given by the expression: $E(R_A) = r_f + \beta_A \cdot (\mathrm{E}(R_M) - r_f)$, where r_f denotes the risk free rate, $\mathrm{E}(R_M)$ denotes the expected return on the market portfolio, and $\beta_A$is the asset's "beta" – a measure of risk relative to the market.

[40] Widen notes that the Fama-French model has been used by Delaware Courts in addition to, or instead of, CAPM (p. 582), supra note 38 *id*. The Fama-French model expands on CAPM by adding size and value factors to the market risk factor in CAPM.

[41] Jetley and Ji, *id.*

[42] See IVO WELCH, CORPORATE FINANCE, supra note 5 *id*, at 215, 227 stating that "everyone uses it", citing research showing that 73% of CFOs reported that they "always or almost always use the CAPM", and concluding that "It is literally the dominant, if not only, widely used model to estimate the cost of capital".

CAPM provides a method for quantifying the stock's risk and its expected influence on the expected return for investors.[43] According to the CAPM, the key to assessing the value of a security is to assess the response of the returns of this security to the returns on the market index. The beta coefficient, β, is defined as the sensitivity of the return of that security to the return of the "market" portfolio.

When valuing businesses, the Delaware courts strongly prefer the CAPM (or similar models) for determining risk-adjusted discount rates. However, once that rate is determined, something akin to the dividend-growth model is frequently applied to predict the company's "terminal" value as a stream of cash flows growing consistently in perpetuity. In those applications, Delaware courts have pegged the anticipated perpetuity-growth rate as necessarily living within the range of values between the anticipated rate of inflation and the anticipated nominal GDP growth.[44] The rate of inflation is considered a floor for a terminal value estimate for a solidly profitable company,[45] while the expected GDP growth rate is considered a ceiling for corporations in mature industries.[46] As is well known by many finance practitioners (though perhaps not appreciated in by utilities regulators), a long-term perpetuity growth rate for a firm in excess of the anticipated GDP growth rate would imply that the firm in question would mechanically come to dominate the entire economy in the long term – a prediction seen by most as simply untenable.[47]

In theory, employing different valuation methodologies for rate setting purposes need not necessarily yield different results. The divergence between the PUCs' preferred model of DCF analysis and the more widely accepted CAPM model may be one of approach, but not outcome. With appropriate inputs, and a reliable market price, the DCF approach should yield a discount rate that is similar to that used by market participants. What is less clear, however, is whether the inputs into the DCF approach are, on the whole, reliable. The expected dividend growth rate—or $E(g)$— used to compute valuations under the DCF model is ultimately and inherently a

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[43] Compare: Love and Marriage (Frank Sinatra, lyrics by Sammy Cahn, 1955).

[44] Leo Strine at Global GT LP v. Golden Telecom, p. 26-27, id.

[45] See Lane v. Cancer Treatment Ctrs. Pf Am., Inc., 2004 WL 1752847, at *31 (Del. Ch. July 30, 2004); Peter A. Hunt, STRUCTURING MERGES & ACQUISITIONS: A GUIDE TO CREATING SHAREHOLDER VALUE 51 (2009).

[46] MICHAEL C. EHRHARDT & EUGENE F. BRIGHAM, CORPORATE FINANCE: A FOCUSED APPROACH 242 (2009).

[47] It is worth noting that there are other alternatives to the CAPM, and that the CAPM has its share of weaknesses too; however, it remains a dominant measure of risk-adjustment in finance.

prediction about the future. And, while accurate and reasonable projected estimates of the perpetuity growth rate in dividends could, *in theory*, yield ROE valuation outcomes similar to the CAPM, many of the central vehicles for generating perpetuity growth rates in DCF settings seem pre-programmed to overshoot. The actual degree of divergence of valuations inferred by different decision makers through different valuation methodologies is an empirical question—one we turn to now.

III. Data and Empirical Tests

In this section, we consider data from actual rate hearings in gas and electric utilities over a twelve-year period, evaluating the extent to which the rate setting process mimics a risk-adjusted return mandate. Our approach will be to treat the awarded return on equity from a rate hearing as a type of "asset price", exploring whether such returns in a manner similar to the returns on an equity investment yielding similar returns.

A. Data and Summary Statistics

We use as our primary data source the Public Utilities Fortnightly (PUF) ROE database, which we hand-collected from 2005 through 2016. The PUF data report on awarded ROEs in gas and electric utilities' rate hearings, across all fifty US states, several Canadian provinces, and the District of Columbia. We augmented this data set by merging it with a variety of other sources. First, we added data on several macroeconomic variables and market indicatives that would have been available to the PUC decision makers at the time of each rate hearing, benchmark rates (such as US Treasuries) and widely-utilized historical and forward-looking predictions on the market equity risk premium (taken from Duff & Phelps annual survey). We also collected Compustat and CRSP data for all publicly traded utilities in our sample (or, in many cases, on their publicly traded parents and holding companies[48]), which included firm-specific information on assets, liabilities, accounting returns, and securities market pricing. To this, we added PUC-specific data from the Institute for Public Utilities at Michigan State University, tabulating the composition, elected/appointed nature and political party representation on state PUCs. Finally, we included data on a unique quasi-field experiment in

[48] It is increasingly common for individual utilities to be wholly owned subsidiaries of parent entities, which in turn own other regulated and unregulated firms. This is a limitation in our data – but we also note that it is a limitation in the data that PUCs are often constrained to use as well.

which state PUC commissioners and their staffs received (on a temporally staggered basis) immersion training in finance and valuation.

We begin with summary statistics before proceeding to present results of a series of regression analyses. Consider first the Raw PUF data, which reports on awarded ROEs in announced regulatory hearings. Figure 1 provides a histogram of awarded ROEs for the entire sample.[49] Note from the Figure that there is considerable heterogeneity around the population mean of 10.1%. At the same time, however, awarded ROEs exhibit a pronounced mode at exactly 10%, suggesting it is a focal "odometer" point for regulators. Indeed, this mode at 10% appears strongly to persist over time.

[Insert Figure 1 Here]

The PUF data report on both gas and electric rate hearings, with a small number of combined gas and electric opinions. Table 1 compares the population of gas rate cases to electric cases. Overall, awarded electric ROEs are very slightly larger than those for gas, with a gap of around twenty basis points that tends to widen at the upper ranges of awarded ROEs (sixty basis points at the 95th percentile). While still not statistically significant without controlling for other covariates, this gap will be born out with more comprehensive analysis below, and may reflect additional considerations that high-end electrical generation / transmission projects receive (e.g., solar arrays). Since we treat gas and electric rate cases in the same analysis below, we will typically include controls for the type of case.

[Insert Table 1 Here]

Table 2 reports on awarded ROEs subdivided by jurisdiction (including three Canadian provinces). Note from the table that there does appear to be some inter-jurisdiction heterogeneity. For example, several states in the South seem to have higher awarded ROEs. There many reasons for this heterogeneity, but it suggests the prudence of allowing for jurisdictional-level effects in the regressions we report below.

[Insert Table 2 Here]

[49] It is worth noting that the unit of analysis for Figure 1 (as well as the analysis that follows) is the utility regulator decision. This is not generally the same as the average ROE in effect at any one time. Indeed, because rate hearings are held on intermittent schedules, new rates do not always replace old ones at regularized intervals.

Figure 2a considers awarded ROEs over time, as a function of the order date in the regulatory rate-setting decision. Note from the figure that there is a slight decreasing trend in awarded ROEs over time, starting at nearly 11% in 2005 but decreasing over time to around 9.5% by 2016. Interestingly, however, the overall reduction in awarded ROEs is not accompanied by lower variation in announced rates, which stays roughly consistent over the entire period (standard deviations are generally in the 50-60 BP range), with the exception of 2007 and 2008, where variance increases (standard deviations in the 80-90 BP range). Notwithstanding this aggregate variation over time, it is still clear from Figure 2a that the clustering of ROE awards around 10 percent persists throughout the observational period.

Of course, *raw* awarded ROEs are not particularly well suited to compare to other financial asset prices, without controlling for capital returns. Table 2b thus considers awarded ROE *spreads* over a (roughly) risk-free benchmark: 20-year U.S. Treasury bond yields. Note from the Figure that, unlike Figure 2a there is a clear and strong upward linear trajectory in the spreads between awarded ROEs and treasuries, from around 5.5% in 2005 to approximately 7.5% in 2016. It is also clearly more cyclical than the raw ROEs, suggesting that the rate setting process may be more impervious to cycles in financial markets than the financial assets it is meant to mimic. (This cyclicity is reflected in consistently higher standard deviations of ROE *spreads* above raw ROEs over the entire period, averaging around 20 BPs.) Nearly identical dynamics can be found against other benchmarks.[50]

[Insert Figures 2a and 2b Here]

It is noteworthy from Figure 2b that awarded ROE spreads have not only been cyclical, but that they have widened over time. It is entirely possible, of course, that allowable ROE spreads over treasuries widened over this period because utilities stocks became more systematically risky during that same period. However, Figures 3a and 3b shed considerable doubt on that hypothesis. Figure 3b tracks the raw, monthly CAPM beta estimates of all publicly traded utilities in the PUF data set (based on a 60-month trailing estimate of returns). As is typical of utilities betas, they tend to be below the market-wide measure of 1.0 (though not uniformly). Note that after a slight increasing trend through 2007, equity betas for utilities began

[50] The trends are almost identical against other tenors of U.S. Treasuries, as well as prevailing LIBOR rates.

to beat a steady retreat starting in 2008, and became overall much less volatile through at least the end of 2015. If utilities stocks as a whole were becoming increasingly risky over the period studied, we would expect that utility betas would increase overall as well. But as can be seen from the figure, the utilities-index beta is generally falling over this period. Figure 3a tracks the abnormal returns of utilities ("alpha") over this period, which were very slightly (though not statistically significantly) higher than zero.

[Insert Figures 3a and 3b Here]

Finally, although not strictly an application of asset pricing, it is perhaps worth asking whether the utilities' realized market return on equity subsequent to a rate hearing matches up well with the awarded ROE.[51] This inquiry is in some ways circular, since the rate case is meant to lock in a subsequent ROE. However, utilities may incur costs or investments in assets after the rate case that cause this mechanical identity to fail. Figure 4 provides a histogram of the extent to which awarded ROEs exceeded the mean realized ROE in the two years after the rate case. As can be seen from the figure, awarded ROEs appear to overshoot realized ROEs by between 1.5 and 1.75 percent—a figure that (while not statistically distinct from zero) raises some general questions about how well utilities rate setting operates. This difference in estimates may sound small, but in the electric and gas utilities industry in the United States, with estimated sector market capitalization of $600 billion[52], it translates into roughly $10 billion a year.

[Insert Figure 4 Here]

B. Identification Strategy

(1) Asset Pricing and financial theory

To investigate the conformity of rate decisions with standard predictions from finance, we now proceed to consider the awarded ROE, treating it as if it were an asset-pricing return on a traded financial asset. More specifically, to assess whether regulators are setting ROEs in a

[51] We calculate realized market return on equity as the investment return (including distributions) realized shareholders over the two years subsequent to the rate hearing.
[52] http://www.investopedia.com/articles/investing/031116/utilities-sector-industries-snapshot-nee-gas.asp

manner consistent with risk-adjusted returns, we test whether awarded ROEs behave on average in a manner that would predicted by the Capital Asset Pricing Model at the time the regulatory decision is made. We focus on CAPM for a variety of reasons. First, it is well known and accepted among finance practitioners and academics as a vehicle estimating returns. By contrast, the (so-called) DCF approach described above has far less acceptance. Second, unlike other empirical asset pricing models (such as Fama-French or other multi-factor models), the CAPM's key input – the market equity risk premium (ERP) – has readily available *forward looking* predictions available for it. Such predictions, in fact, are a key input into valuation arguments that utilize the CAPM, and are generally not available for Fama-French.

The methodology we use requires essentially a two-step process. First, we use CAPM to derive forward-looking predictions of ROE spreads for each utility in our data set at the time of the rate announcement. Second, we compare these predictions to the ROE spreads actually awarded by the regulator, which (as noted above) we hand-collect from 2005 through 2016. The second stage of this process is represented as follows. For each observed rate case with an ROE finding, we consider the following specification:

$$\left(R_{i,t} - r_{f,t}\right) = c_0 + c_1 \cdot \hat{S}_{i,t} + \gamma \cdot Z_{i,t} + \varepsilon_{i,t} \tag{4}$$

where $\left(R_{i,t} - r_{f,t}\right)$ represents the awarded ROE spread over the risk free rate for utility *i* at time *t*, $Z_{i,t}$ is a series of controls (discussed below, and including potential experimental manipulations) and $\varepsilon_{i,t}$ is an error term. The term $\hat{S}_{i,t}$ in (2) is the *predicted* spread of utility *i*'s stock at time *t*, which we derive at the utility level from the predictions of the CAPM. This predicted spread is given by the well-known expression:

$$\hat{S}_{i,t} = \alpha_{i,t} + \beta_{i,t} \cdot E\left(R_{M,t} - r_{f,t}\right) \tag{5}$$

where $\beta_{i,t}$ is the utility stock's risk relative to the market (its "beta"), $\alpha_{i,t}$ is the stock's abnormal deviation from the CAPM (or its "alpha"), and $E\left(R_{M,t} - r_{f,t}\right)$ is the anticipated equity risk premium (ERP). Although the textbook version of CAPM predicts that $\alpha_{i,t} = 0$ for all securities, we allow for deviations based on empirical relationships observable at the time of the rate hearing (and plausibly applicable to utilities). If regulator behavior is consistent with the predictions of CAPM, we would expect $c_0 = \gamma = 0$, and $c_1 = 1$ in Equation (4).

In all the regressions below, we utilize estimated utility- and time-specific values of $\alpha_{i,t}$ and $\beta_{i,t}$, using firm-level data if the utility is public and industry proxies otherwise. In our baseline specifications, we omit all non-CAPM controls; but later we include other (theoretically extraneous) controls that pertain to the commission hearing the rate hearing, including political party composition, size, and fraction elected versus appointed, as well as size and capital structure data on the utility. (This allows us to test the null hypothesis that all extraneous variables are irrelevant to the ROE determination—a hypothesis we reject.) As noted above, the strong prediction of the CAPM is that the coefficient $c_1 = 1$ while $c_0 = 0$. We acknowledge, as others have noted, the CAPM may under-predict returns for smaller-capitalization firms, as well as firms that have extreme market-to-book ratios, inducing a non-zero estimate of $\alpha_{i,t}$. However, we attempt to control for this by including estimates of $\alpha_{i,t}$ when available.

Our analysis explores a variety of estimation approaches for (4) and (5). For publicly traded utilities, we utilized both raw estimated 60-month alphas and betas (as of the month of the rate order), as well as a blended "Ibbotson-adjusted" values of alpha and beta which is a weighted average of the raw beta and/or alpha (weight 2/3) with industry wide counterparts (weight 1/3). For non-traded utilities, the industry alpha and beta prevailing at the time of the PUC order are used. For the ERP, we consider both the historical ERP measure and the (supposedly) more forward looking "Supply-Side" measure, both widely employed by financial professionals and provided by Duff and Phelps on an annual basis.[53] (We confirmed that each of these measures would have been available to the PUC at the time of each rate order.)

Consider our first set of regressions pictured in Table 3, which reports on a basic set of CAPM regressions (with standard errors clustered at the state level, as in all remaining regressions). Note from the Table that our key coefficient of interest, c_1, is not only nowhere near 1.0 (as predicted by the CAPM), but it is consistently *negative* in value. In all specifications, the estimate of c_1 is statistically and economically distinct from its predicted value (of 1) at any conventional confidence level. In addition, the constant (c_0) in the regression appears to reflect a substantial "regulatory abnormal return" embedded in the awarded ROE, above and beyond abnormal deviations predicted through empirical alpha values. The

[53] In all cases, we utilize the ERP predictions from Duff & Phelps, Stocks, Bonds, Bills, and Inflation (SBBI) Yearbook (2005-16) (now published by Wiley & Sons).

inconsistency of awarded ROEs with CAPM, moreover, persists even in the presence of state and year fixed effects.[54] We view this as strong evidence that whatever regulators are doing, they are *not* generally applying accepted asset pricing models to generate forward-looking estimates of equity cost of capital.

[Insert Table 3 Here]

(2) Extended Model

We now proceed to test several correction factors, shedding light on possible factors driving the deviation of regulators from CAPM predictions. If PUCs are not adhering, on average, to asset-price mimicking behavior, then what may be driving their decisions? In this section we lay out a set of hypothesis for $Z_{i,t}$ that might explain the phenomenon, and test them empirically.

a. Financial stability

The patterns we observe above may be driven by risk- or ambiguity-aversion among regulators, who disproportionally discount upside relative to downside political uncertainties.[55] The incentives underlying commissioners' decision making potentially result in a more risk averse policy than is socially desirable. Because the operating failure of utilities is often considered as a social catastrophe, regulators are likely internalize the risk of a financial failure of utilities as cataclysmic.[56] Commissioners are the ultimate political risk bearers for the utility's financial stability; financial distress of the utility carries a heavy political toll. In contrast, the costs of excessive electricity rates is a diffuse one, dispersed among all electricity consumers. Slavishly sticking to standard asset pricing formulations could incentivize utilities to run operations extremely close to the bone. Interruptions in the continuous electricity service and

[54] We note that the inclusion of year fixed effects could absorb much of the explanatory power of our predicted spreads based on CAPM (since the ERP figures vary only annually). Nevertheless, the abnormal regulatory returns remain significant in these specifications.
[55] Eric L. Talley, *On Uncertainty, Ambiguity, and Contractual Conditions,* 34 DEL. J. Corp. L. 755, 767 (2009).
[56] Talley, supra note 55 *id*.

financial distress of the utility undermine the public trust in the commission, potentially leading to a crisis of confidence in public governance.[57]

Commissioners' interests are thus better served by a bias toward greater institutional stability. Significantly, the asymmetrical regulatory incentives and the presence of regulatory capture or revolving doors are independent variables. Commissioners' interests are better served by promoting the industry's interests in higher rates regardless of their future employment opportunities at the regulated industry. Even the most dedicated public servant is expected to be biased towards higher rates given the expected public opinion in case of an operating default. As higher leverage typically results in higher estimated probabilities of financial distress[58], theoretically, utilities can use this regulatory risk aversion and strategically add higher leverage and thereby induce regulators to award higher rates. It is therefore a plausible hypothesis that rate regulators will respond to leverage as a prominent proxy in their rate-making process.

Realized ROEs tend to be persistently and positively related to leverage of all firms, including utilities as shown in Figure 5 below (generated from all public utilities represented in the PUF data).

[Insert Figure 5 Here]

However, our results suggest that in the regulated setting, higher debt-equity ratios appear to have no systematic relationship to awarded ROEs, and leverage appears not to have predictive value as to awarded ROEs (as shown in Table 4 below).

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[57] Azgad-Tromer, supra note __ id. Interruptions of power provision are often considered as social catastrophe and induce a crisis of confidence in public governance, triggering political response. For example, as California utilities were facing bankruptcy in 2001, California imposed statewide rolling blackouts, and ultimately authorized hundreds of millions of dollars to ensure adequate power flows, in what is often referred to as the "California Energy Crisis". LINCOLN L. DAVIES, ALEXANDRA B. KLASS, HARI M. OSOFSKY, JOSEPH P. TOMAIN AND ELIZABETH J. WILSON, ENERGY LAW AND POLICY 54 (2015). In 2003, blackout in the East Coast led to loss of power to over 50 million consumers as the networks in New York, Ontario, Northern Ohio, Michigan and a portion of other states collapsed, with over 60,000 MW of generating capacity knocked out of service, initiating the codification of reliability standardization by the U.S. Congress. https://en.wikipedia.org/wiki/Northeast_blackout_of_2003; http://www.elp.com/Electric-Light-Power-Newsletter/articles/2016/08/13-years-after-the-northeast-black-of-2003-changed-grid-industry-still-causes-fear-for-future.html

[58] For this reason, financial regulators often supervise leverage ratios in banks. See for example Basel III leverage ratio requirements : http://www.bis.org/publ/bcbs189.pdf

b. Operating Reliability

Rate regulators possibly aim to use the rate setting process to sustain thicker operating margins and thereby enhance the reliability of power provision and generation. The continuous and uninterrupted power service is an inherent expectation of our social lives, a core element of the social contract. Higher rates may serve to create an equity cushion that mitigates the risk of power outages due to the technical determinants of electrical energy provision. Reliable and continuous service by utilities requires such equity cushion due to the technical demands of energy provision. First, expenditures are particularly volatile for utilities, as their critical infrastructure is typically very expansive and custom-made, and is prone to severe storms and other natural disasters.[59] Excess capacity induced by supranormal rates may thus serve to sustain operating reserves sufficient to respond to sudden outages of generating plants or transmission lines, sufficiently quickly to accommodate the frequency, voltage, and stability technical parameters required to respond and sustain reliability of electricity service.[60] Second, because electric energy cannot be easily stored, it must be produced and delivered practically simultaneously. "Inventorying" power is still beyond the capacity of most generators. Sustaining the continuous and uninterrupted electricity service therefore requires maintenance of continuous and almost instantaneous balance between production and consumption of electricity in power systems.[61] On certain occasions (such as the Super Bowl), utilities can expect the spike in demand, but not all spikes and dips can be foreseen. To mitigate the risk of power shortages and blackouts, some margin of excess generation capacity above the expected demand load must be kept at all times.[62] Higher awarded rates can sustain investments in excess capacity and thereby enhance the reliability of energy provision in light of the volatility of capital expenditures and the lack of technical storage feasibility.

We are currently investigating these relationships empirically.

c. Commission Composition

Table 4 expands the analysis of Table 3 by adding a variety of firm-level and / or PUC-level controls, as well as a control for electricity rate cases.[63]

[Insert Table 4 Here]

Commission-level controls in Table 4 appear to provide some parts of the story behind regulatory rate setting. Note first that the number of commissioners on the PUC tends to predict a small reduction in "abnormal" awarded ROEs, possibly reflecting the possibility that larger commissions will are more likely to have either commissioners or staff with financial expertise. In addition, we find that the percent of the commission that is elected predicts lower awarded ROEs, with completely elected commission tending to award over 100 basis points lower returns on equity than completely appointed ones. This electoral effect may represent the cost that commissioners pay with rate payers by setting rates too high, and/or the greater impediments to regulatory capture by elected commissioners. Party-affiliated commissioners also appear to be associated with lower ROEs, though this effect does not appear to persist with the introduction of state and year fixed effects, which are likely to absorb party-associated effects for relative stable PUC political compositions (as many are).

This result prompts the need in further research on structural design of the rate setting process. Most of the literature that is concerned with regulatory capture has been developed in the context of utility regulation.[64] Regulators often have an industry background, and their discretion may be biased due to the cultural proximity, including the shaping of assumptions, lenses and vocabularies as well.[65] Industry actors may provide a variety of inducements, including future employment options and selectively burnishing the reputational capital of commissioners, each of which might enhance their tendency to make pro-industry decisions.[66]

[63] All regressions in the Table utilize Ibbotson-adjusted Beta estimates and Supply-Side ERPs.

[64] Ernesto Dal Bo, *Regulatory Capture: An Overview*, 22 OXFORD REVIEW OF ECONOMIC POLICY 203 (2006). Capture was recently defined by The Tobin Project as "the result or process by which regulation… is consistently or repeatedly directed away from the public interest and towards the interests of the regulated industry"

[65] James Kwak, Cultural Capture, in PREVENTING REGULATORY CAPTURE supra note **Error! Bookmark not defined.** id. DANIEL CARPENTER AND DAVID A. MOSS, PREVENTING REGULATORY CAPTURE 15 (2014).

[66] For a specific application of revolving doors in public utility commissions, see Marc T. Law and Cheryl X. Long, *Revolving Door Laws and State Public Utility Commissioners*, 5 REGULATION & GOVERNANCE 405–424 (2011). For a strategic defense of revolving doors' efficiency see David J. Salant, David J, Behind the Revolving Door: A New View of Public Utility Regulation, 26(3) THE RAND JOURNAL OF ECONOMICS, 362–377 (1995).

The institutional, professional and social proximity of rate regulators to executives of regulated utilities suggests that aspects of regulatory capture may play some role, though we are not readily able to quantify this effect. Indeed, few regulators have been found guilty of corruption and capture theory has scant empirical support. The literature on capture remains focused on inferences from statistical correlations: Looking at the ultimate beneficiaries of the regulatory outcome and inferring the regulatory purpose from there.[67] Our results suggest that some regulatory structures may be more susceptible to capture than others, possibly suggesting various potential defense mechanisms jurisdictions might utilize. (We leave such questions largely to future research.)

d. Expertise and Training: A Quasi-Field Experiment

Although PUC commissioners and staff may be incentivized by a variety of factors other than asset-pricing concerns when setting rates, another factor deserving attention is whether the regulatory decision makers simply lack the expertise to evaluate finance-based arguments, thereby causing them to look to orthogonal factors. In other words, is the stark deviation from the predictions of CAPM illustrated above an artifact of some type of regulatory limitation on competence or receptivity to finance, or is it more reflective of inadequate training of regulators?

Our data allow us to test this question, using a fortuitous natural experiment. The Institute for Regulatory Law & Economics (IRLE) is a regulatory training endeavor sponsored by the University of Colorado Law School's Silicon Flatirons Center as a means of supporting thoughtful regulatory decision-making. From 2004-2016, the IRLE hosted an annual one-week summer workshop for state public utility commissioners and staff, with the goal of educating regulators about how to use economic analysis within the regulatory decision making.[68] The IRLE advertised its annual program as follows:

[67] Daniel Carpenter, D*etecting and Measuring Capture,* in PREVENTING REGULATORY CAPTURE: SPECIAL INTEREST AND HOW TO LIMIT IT (Daniel Carpenter and David A. Moss eds,2014); Ernesto Dal Bo and Martin A. Rossi, C*orruption and Inefficiency: Theory and Evidence from Electric Utilities*, 91 JOURNAL OF PUBLIC ECONOMICS, 939-962 (2007).For a specific application of revolving doors in public utility commissions, see Marc T. Law and Cheryl X. Long, *Revolving Door Laws and State Public Utility Commissioners*, 5 REGULATION & GOVERNANCE 405–424 (2011). For a strategic defense of revolving doors' efficiency see David J. Salant, David J, Behind the Revolving Door: A New View of Public Utility Regulation, 26(3) THE RAND JOURNAL OF ECONOMICS, 362–377 (1995).
[68] The institute did not host a Summer Workshop in 2015.

> Each May, the IRLE hosts a seminar geared towards educating state regulators about economic analysis of regulatory policy issues. Notably, the Institute distills the critical law and economics issues that arise in closely-regulated network industries and presents them in a coherent fashion. To present its curriculum, the IRLE draws on the expertise of leading academics, practitioners, and scholars. In short, the IRLE teaches regulators how to appreciate insights that emerge from important economic principles and concepts as well as how to apply them to regulatory situations in network industries.[69]

For the first four years of the workshop, finance was *not* included as part of the curriculum; but beginning in 2008, the IRLE began to devote an entire day (6 hours of lecture time) to finance, where regulators were exposed to some of the key components to discounted cash flow analysis and the CAPM, using examples from actual rate cases to motivate discussion.[70]

Although participants in the workshop were required to opt into attendance (and thus they self-selected), the mid-stream introduction of finance content helps to address some of the concerns that one might have with selection bias. In several baseline specifications, we compare treated commissions (i.e., those who attended) with untreated ones (those who never attended). However, in other specifications we consider the effect of finance training solely within the population of commissions that opted the IRLE workshops (effectively constructing a "placebo" group consisting of those PUCs who opted into the workshop but did not receive finance training in the first four years). Table 5 summarizes the first year in which the commissions in our observation sample attended IRLE's program, as well as the first year the commission received "treatment" by finance training. (In some cases, the commission attended the program but did not receive finance treatment because their years of attendance pre-dated the provision of finance).

[Insert Table 5 Here]

Our identification strategy comes from the following specification:

$$\left(R_{i,t} - r_{f,t}\right) = c_0 + c_1 \cdot \hat{S}_{i,t} + c_3 \cdot FinTrain_{i,t} \tag{6}$$
$$+ c_4 \cdot FinTrain_{i,t} \cdot \hat{S}_{i,t} + \gamma \cdot Z_{i,t} + \varepsilon_{i,t}$$

[69] IRLE Website: https://siliconflatirons.org/events/institute-for-regulatory-law-and-economics-irle/

[70] In the interests of full disclosure, one of the co-authors of this study (Talley) delivered the finance course in every year it was offered.

This specification is identical to equation (4), except for the addition of (a) an affine treatment effect variable $FinTrain_{i,t}$ that takes on the value of 1 if any member/staffer of PUC i has received finance training treatment on or before year *t*, and (b) a slope-shifting interaction term $FinTrain_{i,t} \cdot \hat{S}_{i,t}$, which allows for a training-induced change in the coefficient on the slope of the expected spread of the utility. The treatment effect from CAPM training would thus plausibly be reflected through shocks to both coefficients c_3 and c_4. Given the deviations from CAPM found in Tables 3 and 4 above, training would induce regulatory decisions more line with finance theory if $c_3 < 0$ and/or $c_4 > 0$. (Note in addition that the average combined CAPM coefficients for treated commissions would be a summed shift effect of $(c_0 + c_3)$ and a summed slope effect of $(c_1 + c_4)$.)

Tables 6 summarizes our results.[71] In the Table, the left panel considers all untreated PUCs, as a control, regardless of whether they opted to attend the IRLE program; the right panel retains only those PUCs that participated in the IRLE program (a universe that includes a "placebo" group never treated with finance training). As the Table illustrates, finance training results in some *moderate* effects on later ROE setting. First, the effect of finance training on the shift parameter (c_3) is consistently negative and statistically significant in the presence of various utility-level controls. Its economic significance (around 50 bps) is also notable, representing just under one standard deviation in raw announced spreads (see Table 1). Second, finance training also alters the CAPM slope coefficient the predicted direction, albeit modestly. The point estimates of the slope parameter (c_4) is mildly positive, but not statistically significant; and the point estimate is high enough that, when combined with the baseline slope estimate, treated PUCs exhibit a very slight positive relationship between systematic risk and awarded ROE. The electoral responsiveness of commissions appears to persist in the presence of treatment, but the size effect disappears in the right panel of regressions, suggesting that PUCs seeking treatment (regardless of whether they received finance training) tended to alter their decision making less as a function of size than untreated commissions.

[Insert Table 6 Here]

[71] As with the previous results, Table 6 clusters standard errors at the state level.

Two caveats deserve explicit attention before proceeding. First, we cannot rule out whether our findings as to the trainability of PUC regulators and staffs turned critically on the specific design of the treatment offered. The training program, part of a larger week-long immersion program in regulatory law and economics, was consistently staffed by substantially the same faculty over the observation period, proceeding in roughly consistent sequence. Although we observe program where finance training was not part of the curriculum (a convenient form of heterogeneity for selection-bias correction), our data therefore still do not permit us to distinguish about whether a peculiar aspect of this specific program was particularly effective.[72]

Second, to the extent that training is effective, we want to be cautious about whether greater fidelity to asset pricing is itself conducive to overall welfare concerns. Indeed, to the extent that accurate risk-adjusted returns adjudication crowds out other laudable social policy goals, the trainability of regulators may ultimately be normatively undesirable, at least for certain plausible alternative objectives regulators may pursue (such as dynamic incentive provision). We note, however, that while training tends to dampen several other predictive factors in rate-setting, they remain in the picture, and thus it does not necessarily follow that better risk pricing necessarily crowds out other goals.

All told, we view these results as evidence that there exists some potential to train legal decision-makers to utilize the concepts of finance. We note that the effect is concentrated in the shift parameter, and that it is still a fraction of the size of the abnormal portion of the ROE spread. Training evidently has mild effects on PUCs' responsiveness to prevailing systematic risk through the slope parameter. It may be possible that a multi-day or otherwise more immersive form of training would have even greater effects, but our data do not permit us to unpack this possibility.

[72] We note, for example, that finance training component in all observed years was provided by a single instructor (Talley).

IV. Conclusion

Under U.S. law, a public utility is entitled to earn a return on the value it employs for the convenience of the public equal to that made on investments in other businesses which are attended by corresponding risks.[73] We conducted an empirical analysis of rates awarded by PUCs in the U.S. and in Canada over a twelve year period (2005-2016), in order to assess the relationship of awarded rates of return on equity to standard asset pricing models adjusting expected rates of return with anticipated risks. Our analysis demonstrates that rate setting practices adopted by PUCs diverge appreciably (even violently) from the predictions of financial economics across numerous dimensions.

Instead, our analysis suggests that current regulatory practice more plausibly reflects an amalgam of other desiderata that include political goals, incentive provision, insufficient financial expertise and regulatory capture. We identify some factors may be at play, including the possibility that regulators' behavior reflects objectives that are either orthogonal or opposed to precise risk-return calibration, such as serving political constituencies, providing dynamic incentives, and possibly even regulatory capture. We find evidence that the structural composition of the commission is correlated with the awarded rates: The percent of the commission that is elected predicts lower awarded ROEs, with completely elected commission tending to award up to 115 basis points lower returns on equity than completely appointed ones. We additionally conjecture that the divergence of observed regulatory behavior from asset-pricing fundamentals may be due (in part) to a lack of financial valuation expertise among regulators. To test this conjecture, we study a unique field experiment that exposed commissioners and their staffs to immersion training in finance. We find evidence that treated PUCs began to issue ROE rulings that were (moderately) more aligned with standard asset pricing theory than those of untreated placebo groups.

[73] Bluefield Waterworks v. Public Service Comm'n, 262 U.S. 679 (1923). Accord FPC v. Hope Natural Gas Company, 320 U.S. 591 (1944)

Appendix: Tables and Figures

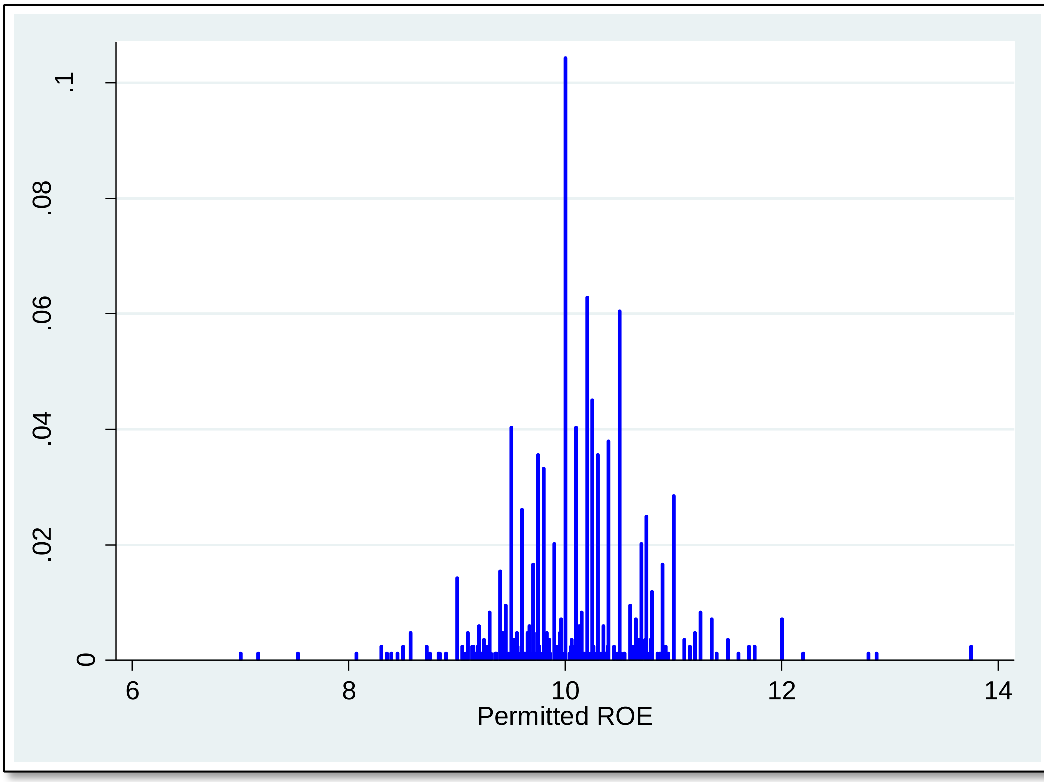

Figure 1: Histogram of Awarded ROEs (Source: Public Utilities Fortnightly, 2005-2016)

	Combined	Gas	Electric
Mean	10.113	10.014	10.188
S.D.	0.650	0.635	0.647
5%	9.14	9.05	9.23
25%	9.75	9.69	9.80
50%	10.10	10.10	10.15
75%	10.50	10.40	10.50
95%	11.00	10.85	11.25
N Obs	844	364	482

Table 1: Awarded ROE by Utility Type

State	Obs	Mean	S.D.	Min	Max	State	Obs	Mean	S.D.	Min	Max
AB	4	9.288	1.324	8.3	11.1	NC	10	10.460	0.306	10	11
AK	8	10.817	1.441	9.3	12.875	ND	9	10.350	0.483	9.5	10.75
AL	4	12.275	1.703	10.8	13.75	NE	4	9.925	0.395	9.6	10.4
AR	14	9.829	0.285	9.4	10.25	NH	5	9.636	0.076	9.5	9.67
AZ	12	9.938	0.490	9.5	11	NJ	10	9.920	0.283	9.55	10.3
CA	24	10.797	0.689	8.5	11.6	NL	1	8.500	.	8.5	8.5
CO	21	10.131	0.988	7.53	12	NM	7	9.906	0.293	9.48	10.27
CT	13	9.486	0.498	8.75	10.25	NV	15	10.163	0.420	9.3	10.7
DC	5	9.555	0.284	9.25	10	NY	44	9.514	0.464	9	10.7
DE	6	9.908	0.213	9.7	10.25	OH	13	10.258	0.301	9.84	10.65
FL	15	10.740	0.539	10	11.75	OK	13	10.280	0.343	9.5	10.75
GA	6	10.728	0.346	10.12	11.15	ONT	12	8.958	0.480	8.35	9.43
HI	9	10.200	0.570	9	10.7	OR	22	9.882	0.247	9.4	10.175
IA	11	10.609	0.835	10	12.2	PA	3	10.267	0.231	10	10.4
ID	15	10.170	0.595	9.5	12	QUE	1	8.900	.	8.9	8.9
IL	53	9.807	0.560	8.72	10.68	RI	5	9.960	0.508	9.5	10.5
IN	33	10.002	0.613	7	10.5	SC	11	11.009	0.717	10.2	12
KS	9	9.756	0.422	9.1	10.4	SD	1	9.250	.	9.25	9.25
KY	16	10.252	0.228	9.8	10.63	TN	5	10.206	0.166	10.05	10.48
LA	23	10.648	0.477	9.95	11.25	TX	24	9.869	0.254	9.5	10.4
MA	18	9.737	0.319	9.2	10.35	UT	11	10.160	0.294	9.8	10.61
MD	23	9.767	0.327	9.31	11	VA	28	10.118	0.438	9.5	11.5
ME	7	9.929	0.766	8.45	11	VT	7	9.923	0.427	9.45	10.7
MI	39	10.472	0.323	9.9	11.15	WA	29	10.045	0.285	9.5	10.4
MN	31	10.054	0.682	7.16	10.88	WI	86	10.457	0.414	9.45	11.2
MO	23	10.132	0.479	9.5	11.25	WV	1	9.750	.	9.75	9.75
MS	5	9.587	0.315	9.225	10.07	WY	18	10.144	0.507	9.5	10.9
MT	2	9.650	0.212	9.5	9.8						

Table 2: Awarded ROE by Jurisdiction (Incudes some Canadian Provinces)

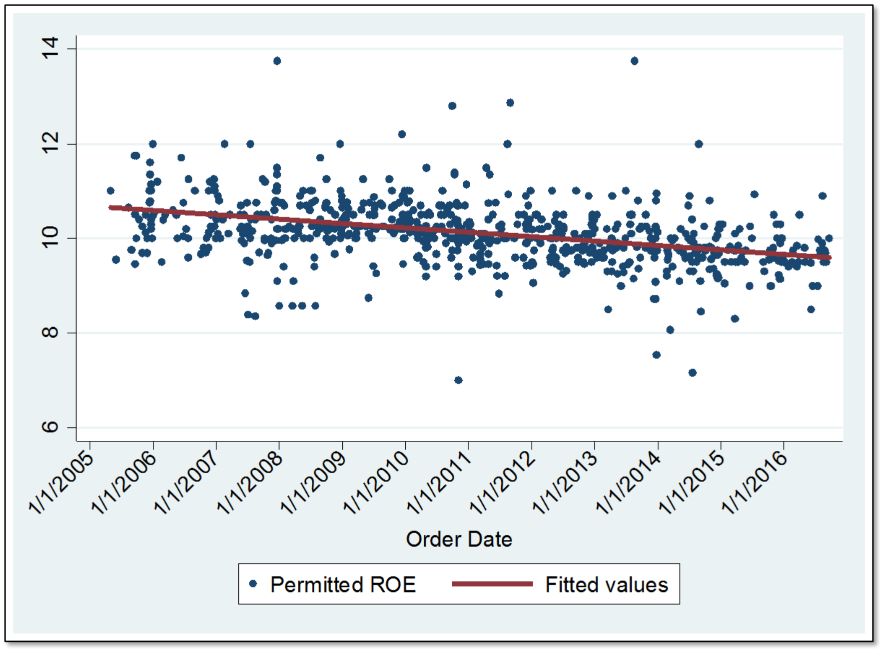

Figure 2a: Awarded ROEs, by Order Date

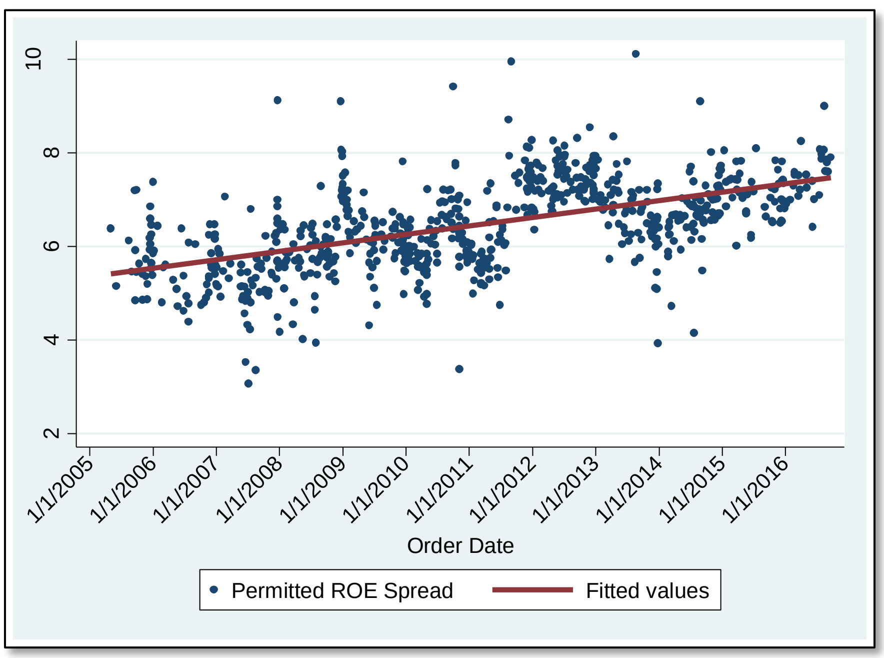

Figure 2b: Awarded ROE spreads over 20-yr US Treasuries, by Order Date

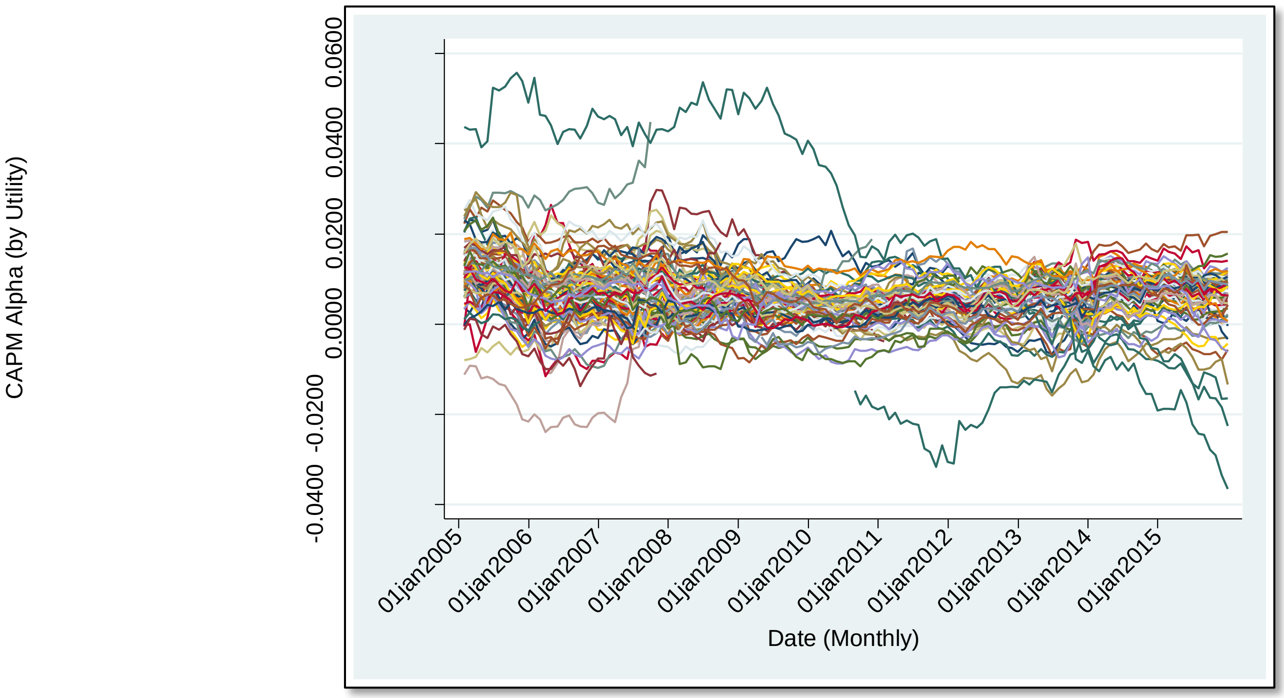

Figure 3a: Utility Alphas, by Month (60-month trailing CAPM estimation). Source: CRSP

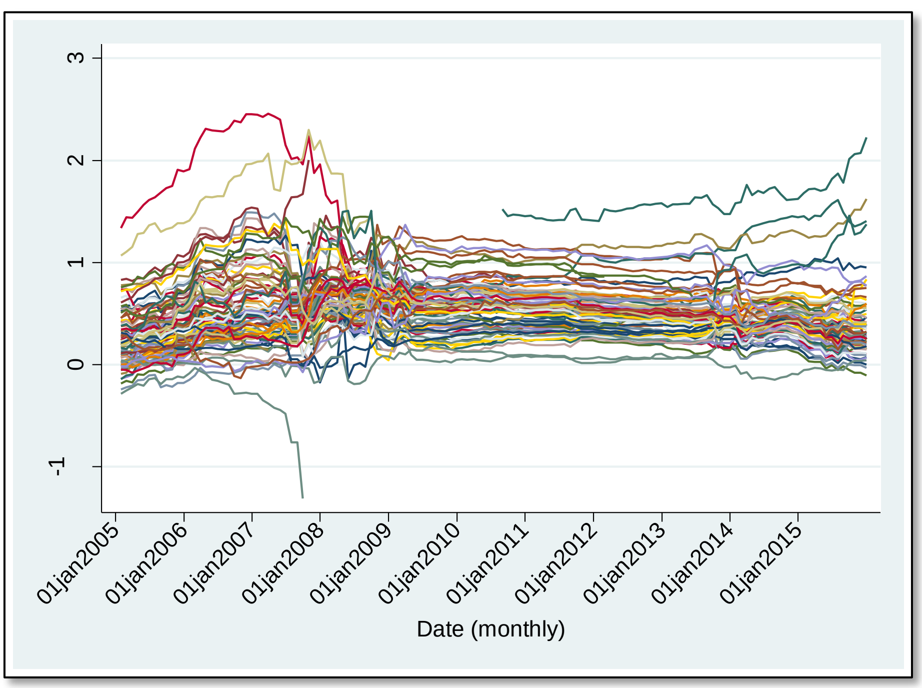

Figure 3b: Utility Betas, by Month (60-month trailing CAPM estimation). Source: CRSP

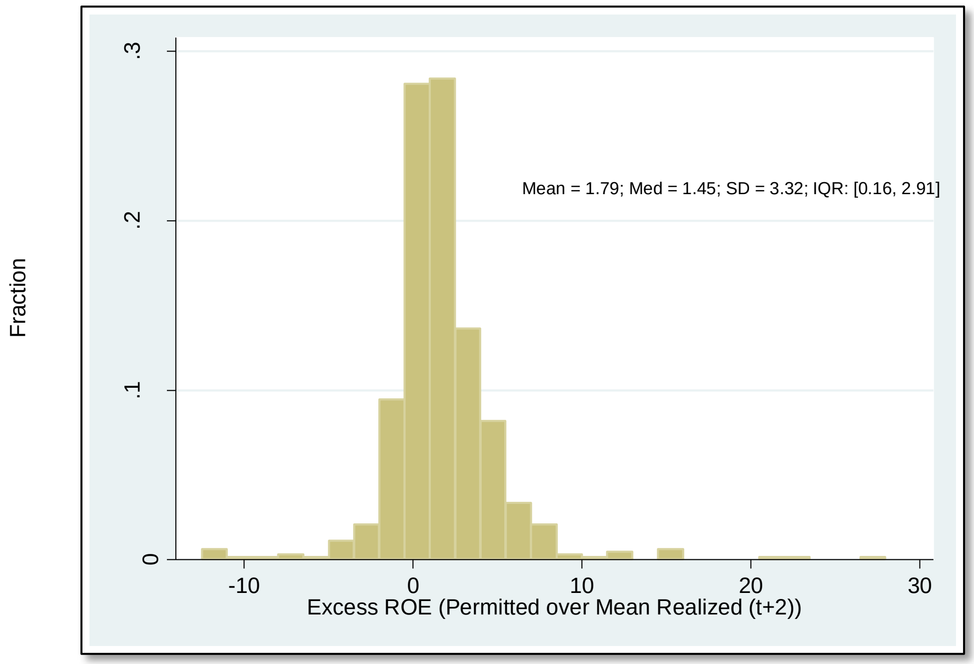

Figure 4: Excess of Awarded ROE over Mean Realized ROE (Two-Year Lead)

	Raw a & b x Historical ERP				Raw a & b x Supply-Side ERP			
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
a + b· ERP	-0.136***	-0.011	-0.141***	-0.013	-0.142***	-0.011	-0.147***	-0.014
	(-7.62)	(-0.80)	(-7.46)	(-0.93)	(-7.00)	(-0.73)	(-6.85)	(-0.88)
Constant	7.038***	7.658***	7.061***	7.735***	7.002***	7.655***	7.022***	7.733***
	(69.52)	(69.01)	(88.51)	(91.13)	(69.49)	(69.26)	(86.54)	(90.90)
State Fixed Effects	No	No	Yes	Yes	No	No	Yes	Yes
Year Fixed Effects	No	Yes	No	Yes	No	Yes	No	Yes
R^2	0.0608	0.5052	0.061	0.506	0.0527	0.5052	0.053	0.506
c^2	58.093	1173.033	55.61	106.64	48.967	1166.418	46.92	106.62
p-val	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
N	840	840	840	840	840	840	840	840
H_A: a + b · ERP = 1	4068***	5684***	3649***	5211***	3163***	4338***	2853***	4022***
H_B: a + b · ERP = 1\ Constant = 1	5219***	7493***	7834***	4723***	4907***	6574***	7489***	4412***
	Ibbotson a & b x Historical ERP				Ibbotson a & b x Supply-Side ERP			
	[9]	[10]	[11]	[12]	[13]	[14]	[15]	[16]
a + b· ERP	-0.229***	-0.014	-0.236***	-0.018	-0.237***	-0.015	-0.243***	-0.019
	(-8.86)	(-0.71)	(-8.66)	(-0.85)	(-8.00)	(-0.64)	(-7.81)	(-0.79)
Constant	7.437***	7.671***	7.469***	7.753***	7.363***	7.667***	7.389***	7.748***
	(61.52)	(63.04)	(64.53)	(79.30)	(60.88)	(63.21)	(62.50)	(78.90)
State Fixed Effects	No	No	Yes	Yes	No	No	Yes	Yes
Year Fixed Effects	No	Yes	No	Yes	No	Yes	No	Yes
R^2	0.0865	0.5051	0.086	0.506	0.0731	0.5051	0.073	0.506
c^2	78.469	1168.482	75.08	106.56	64.017	1161.716	60.92	106.54
p-val	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
N	840	840	840	840	840	840	840	840
H_A: a + b · ERP = 1	2254***	2542***	2053***	2363***	1748***	1936***	1593***	1819***
H_B: a + b · ERP = 1 & Constant = 1	3811***	4333***	4164***	3149***	3924***	4124***	3906***	3172***

Table 3. CAPM OLS regressions. Dependent Variable = Permitted ROE spread over 20-year US Treasuries, by rate case. The panels explore permutations of equity as and bs (Raw versus Ibbotson-adjusted) and the market Equity Risk Premium (Historical versus Supply-Side), always estimated on the month of the PUC order. (For non-traded utilities, the industry a and b prevailing at the time of the PUC order is used.) Test statistics for notable CAPM hypotheses are shown in the bottom of each panel. Notation {+, *, **, ***} denotes significance at the {0.10, 0.05, 0.02, 0.01} levels; t-stats in parentheses. Standard Errors clustered by state.

	[1]	[2]	[3]	[4]	[5]	[6]
$a + b \cdot$ ERP	-0.217***	-0.222***	-0.209***	-0.022	-0.023	-0.024
	(-7.66)	(-7.17)	(-6.98)	(-0.90)	(-0.96)	(-0.91)
Constant	6.775***	8.275***	7.811***	7.558***	8.057***	8.091***
	(23.11)	(27.74)	(16.79)	(26.88)	(40.19)	(23.49)
Electric	0.092	0.182***	0.095	0.175***	0.188***	0.163***
	(1.46)	(2.99)	(1.60)	(4.02)	(4.54)	(3.90)
ROE	-0.002		-0.004	0		0
	(-0.43)		(-1.06)	(0.02)		(-0.20)
ln(Assets)	0.063+		0.069+	0.005		0.007
	(1.85)		(1.83)	(0.19)		(0.25)
D/E Ratio	-0.034		-0.025	0.009		0.016
	(-0.92)		(-0.62)	(0.34)		(0.54)
# of Commissioners		-0.138***	-0.143***		-0.061*	-0.083**
		(-3.58)	(-3.74)		(-2.21)	(-2.58)
Percentage Elected		0.24	0.169		-1.171***	-1.168***
		(1.00)	(0.67)		(-3.76)	(-3.52)
Percentage Women		0.163	-0.026		0.074	-0.051
		(0.48)	(-0.08)		(0.36)	(-0.23)
Percentage Democrat		-0.898***	-0.790***		-0.015	0.08
		(-3.55)	(-3.47)		(-0.09)	(0.49)
Percentage Republican		-0.523*	-0.497+		0.012	-0.001
		(-1.98)	(-1.86)		(0.07)	(-0.01)
State Fixed Effects	No	No	No	Yes	Yes	Yes
Year Fixed Effects	No	No	No	Yes	Yes	Yes
R^2	0.10	0.15	0.16	0.55	0.53	0.56
c^2	75.466	175.353	180.195	112.73	17288.17	322.97
p-val	0	0	0	0	0	0
N	705	823	699	705	823	699
H_A: $a + b \cdot$ ERP = 1	1853***	1555***	1634***	1692***	1847***	1516***
H_B: $a + b \cdot$ ERP = 1 & Constant = 1	1884***	2059***	1783***	910***	1141***	773***

Table 4. CAPM regressions with additional utility- and PUC-level controls. Dependent Variable = Permitted ROE spread. All Beta computations are Ibbotson adjusted and use Supply-Side Equity Risk Premium. Test statistics for notable CAPM hypotheses are shown in the bottom panel. Notation {+, *, **, ***} denotes significance at the {0.10, 0.05, 0.02, 0.01} levels; t-stats in parentheses. Standard Errors clustered by state.

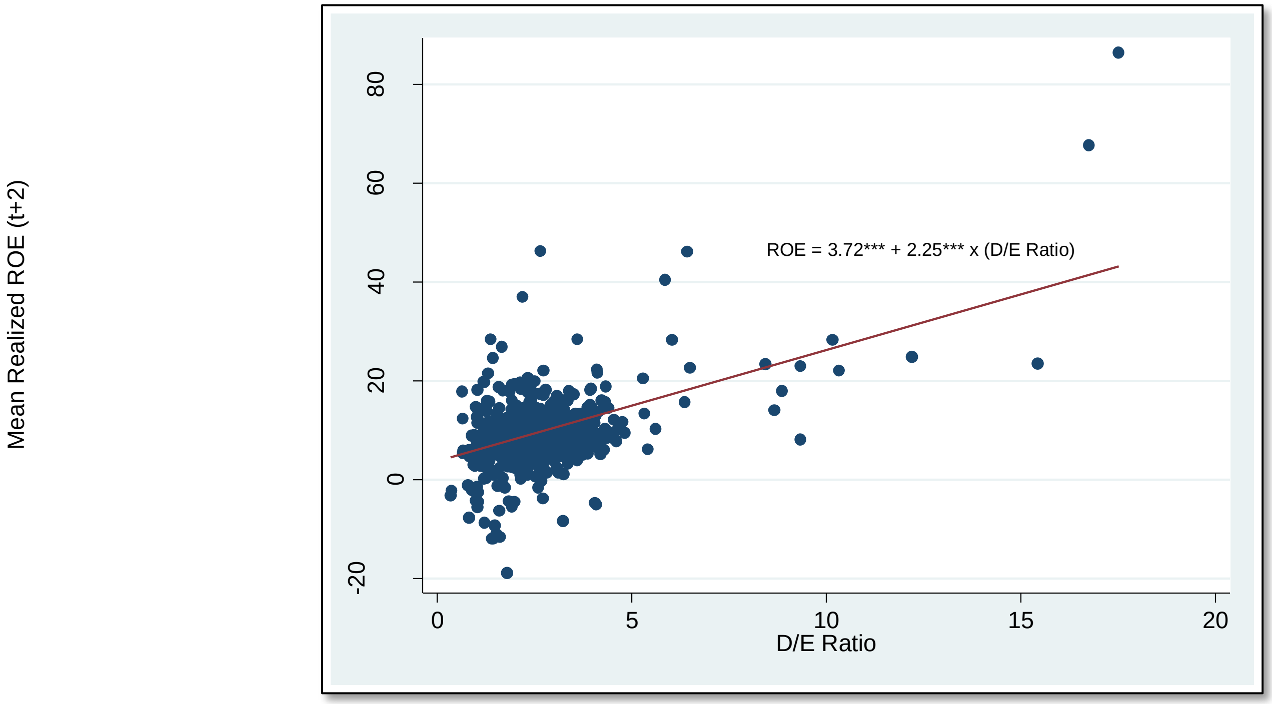

Figure 5. Mean Realized ROE (Two-Year Lead) and D/E Ratio. Source: Compustat, 2005-2016. (***=significance at the 0.001 level)

State	1st IRLE Year	1st Finance Year	State	1st IRLE Year	1st Finance Year
AL			MT	2004	2011
AK	2004	2008	NE		
AZ	2010	2010	NV		
AR	2004	2016	NH	2005	
CA	2004		NJ		
CO	2004	2008	NM	2005	
CT	2011	2011	NY		
DC	2004	2009	NC	2004	2016
DE			ND	2004	2010
FL	2004	2012	OH	2012	2012
GA			OK	2005	
HI			OR	2004	2013
ID			PA	2013	2013
IL	2005	2008	RI	2005	2008
IN	2004	2008	SC	2005	2009
IA	2004	2011	SD	2004	2013
KS	2004	2011	TN	2006	2011
KY	2012	2012	TX	2005	
LA			UT		
ME			VT	2007	2008
MD	2004		VA		
MA	2004	2008	WA	2007	2012
MI	2007	2009	WV		
MN	2008	2008	WI	2005	2009
MS			WY		
MO	2004	2010			

Table 5. Finance Training in IRLE Summer Institute, by (a) First Year of Attendance; and (b) First Year attendees received Finance Training.

	Control Grp = All Untrained PUCs				Control Grp = Untrained IRLE PUCs			
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
a + b ERP	-0.013	-0.024	-0.02	-0.024	-0.038	-0.051	-0.038	-0.051
	(-0.54)	(-0.98)	(-0.78)	(-0.88)	(-1.20)	(-1.66)	(-1.13)	(-1.52)
FinTrain x (a + b ERP)	0.003	0.037	0.007	0.029	0.051	0.083	0.047	0.072
	(0.06)	(0.61)	(0.13)	(0.50)	(0.80)	(1.14)	(0.76)	(1.03)
Constant	7.758***	7.742***	8.206***	8.301***	7.857***	7.649***	8.070***	8.093***
	(57.17)	(27.16)	(35.94)	(24.75)	(40.07)	(18.33)	(28.14)	(19.26)
FinTrain	-0.259	-0.410+	-0.252	-0.414+	-0.371	-0.548*	-0.366	-0.537*
	(-1.10)	(-1.78)	(-1.08)	(-1.78)	(-1.40)	(-2.19)	(-1.43)	(-2.25)
Electric	0.204***	0.184***	0.193***	0.171***	0.217***	0.197***	0.216***	0.191***
	(4.80)	(4.17)	(4.60)	(4.03)	(3.89)	(3.26)	(3.85)	(3.21)
ROE		0		-0.001		0.003		0.005
		(-0.18)		(-0.54)		(0.55)		(0.87)
ln(Assets)		0.005		0.006		0.002		0.007
		(0.16)		(0.22)		(0.05)		(0.16)
D/E Ratio		0.012		0.018		0.076*		0.077+
		(0.42)		(0.60)		(2.14)		(1.98)
# of Commissioners			-0.068***	-0.092***			-0.045	-0.066
			(-2.69)	(-3.23)			(-1.34)	(-1.65)
Percentage Elected			-0.950***	-0.854**			-0.994**	-1.267***
			(-3.17)	(-2.42)			(-2.56)	(-3.70)
Percentage Women			0.052	-0.067			0.057	-0.161
			(0.24)	(-0.31)			(0.21)	(-0.67)
Percentage Democrat			-0.016	0.071			0.017	0.023
			(-0.10)	(0.44)			(0.08)	(0.11)
Percentage Republican			-0.012	-0.032			0.177	0.072
			(-0.07)	(-0.17)			(0.98)	(0.38)
State Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.523	0.556	0.534	0.57	0.53	0.553	0.534	0.559
c^2	142.17	123.38	196.94	106.53	106.02	168.88	483.28	1014.28
p-val	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
N	840	705	823	699	574	478	574	478
H_A: (a+b ERP) + FinTrain x (a+b ERP) = 1	390.6***	248.3***	421.1***	281.4***	254.8***	158.6***	259.6***	165.9***
H_B: Constant + FinTrain = 0	1565.6***	378.9***	1061.4***	418.1***	1309.9***	200.6***	590***	238.3***
H_C: H_A & H_B	1340.1***	951.6***	532***	221.6***	1438.3***	102.6***	296.6***	120.2***

Table 6 Effects of Finance Training on Rate Setting. Dependent Variable = Permitted ROE spread. Manipulations are reflected in (a) the shift parameter "FinTrain", which equals 1 if the PUC had received an offer of treatment on or before the year of the observed order (and 0 otherwise); and (b) the slope parameter of "FinTrain x Beta x ERP". All Beta computations are Ibbotson adjusted and use Supply-Side Equity Risk Premium. Test statistics for notable CAPM hypotheses are shown in the bottom panel. The left panel uses all non-treated PUC-years as a control, while the right panel limits control group to PUCs seeking treatment at some time. Notation {+, *, **, ***} denotes significance at the {0.10, 0.05, 0.02, 0.01} levels (2-tailed test); t-stats in parentheses. Standard Errors clustered by state.

Written Evidence of Dr. Cleary filed in the 2023 Alberta Generic Cost of Capital Proceedings

Exhibit AT

Regulated Inequity

How regulators' acceptance of flawed financial analysis inflates the profit of public utility companies in the United States

Thomas Sikes, M.S.

January, 2022

Table of Contents

I. Introduction

A critical aspect of public utility regulation is the determination of the allowed return on equity ("ROE") incorporated in rates charged to customers, otherwise known as ratepayers.[1] The awarded ROE is intended to match the utility's cost of equity required to finance its assets. This is one of the more contentious parts of ratemaking as the cost of equity cannot be directly observed and is therefore estimated using financial models. Two landmark cases before the U.S. Supreme Court established standards for a fair rate of return. In *Bluefield*, the Court ruled, "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."[2] In *Hope*, the Court affirmed, "[T]he 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."[3]

The Federal Energy Regulatory Commission ("FERC" or "the Commission"), as the U.S. regulator of interstate transmission of electricity and gas, is bound to the *Bluefield* and *Hope* standards when ruling on the ROE awarded to utilities under its jurisdiction. The methodology FERC uses to determine the ROE is subject to interpretation and has evolved over time. The most recent iteration which established the Commission's techniques for determining the fair

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[1] When an ROE is incorporated into utility rates, it namely involves investor-owned utilities, hence the need to compensate *equity* holders. However, those involved with publicly-owned utilities can take interest in this analysis as lenders to those firms expect a similar overall cost of capital as the IOUs in the form of interest coverage ratios.

[2] *Bluefield Water Works and Improvement Company v. Public Service Commission of West Virginia* (262 U.S. 679) (1923).

[3] *Federal Power Commission et. al. v. Hope Natural Gas Company* (320 U.S. 591) (1944).

ROE came from Opinion 569-A, issued in May 2020, which found the just and reasonable ROE for the Transmission Owners of the Midcontinent Independent System Operator ("MISO TOs") to be 10.02%.[4] FERC's finding resulted from the application of three financial models used to determine the cost of equity: the Risk Premium methodology, the Discounted Cash Flow ("DCF") model, and the Capital Asset Pricing Model ("CAPM").

The purpose of this paper is to demonstrate that the methodology employed by FERC in Opinion 569 to award the MISO TOs' ROE was biased upwards with the effect of favoring the financial interests of utility shareholders at the expense of ratepayers. The Risk Premium methodology is transparently circular as its result is tautologically dependent on past Commission rulings and can be summarily dismissed. The DCF analysis, although less self-fulfilling than the Risk Premium model, remains significantly biased in that its inputs are inextricably linked to regulatory outcomes. The CAPM is the only approach which can claim to reasonably avoid the circularity issue, although FERC misspecified the model which resulted in it affirming, and even exceeding, the estimates from the self-fulfilling methodologies. Unfortunately, mostly nothing about Opinion 569 could be considered aberrant in the context of utility ratemaking in the United States, whether be it for electric, gas, or water utilities. It is in fact an apt case-study which encompasses the prevailing methodologies used, in one form or another, by utility commissions throughout the nation to determine the ROE. As such, examination of the fallacies behind Opinion 569 reveals in general how regulators' acceptance of flawed financial analysis inflates the profit of public utilities.

[4] *Association of Businesses Advocating Tariff Equity v. Midcontinent Independent System Operator, Inc.*, Opinion No. 569-A, 171 FERC ¶ 61,154 at P 3 (2020).

Discarding the circular Risk Premium and DCF models and stripping away the biased adjustments to the CAPM reveals a 5.84% just and reasonable cost of equity for the MISO TOs. Utility company witnesses and regulators would almost certainly deride the proposition that the utility cost of equity could be this low. This response, however, would merely reflect the degree of distorted thinking which supports the current framework. After all, the 5.84% estimate results from a standard application of the CAPM, the most widely used model in determining the required rate of return for stocks,[5] and appropriately reflects a discount from the expected return on the overall stock market to account for utilities' low business risk. The principle at stake in ROE proceedings, that public utilities are awarded a fair rate of return on investment when considering their level of risk, cannot credibly claimed to have been upheld when utilities are awarded an ROE that equals, let alone exceeds, the expected return from the overall stock market.

The paper proceeds as follows: Section II covers FERC Opinion 569 with several subsections which address the financial models used to determine FERC's finding on the MISO TOs' cost of equity and explains the 5.84% estimate of the just and reasonable ROE from this analysis. Section III discusses two closely related issues to the determination of the ROE: Capital Structure and ROE incentives, whereby regulators' current approaches can likewise be seen as favoring utility investors at ratepayers' expense. Section IV concludes the analysis.

[5] *Association of Businesses Advocating Tariff Equity v. Midcontinent Independent System Operator, Inc.*, Opinion No. 569, 169 FERC ¶ 61,129 at footnote 501, citing Michael C. Ehrhardt and Eugene F. Brigham, Financial Management: Theory and Practice 253 (13th ed. 2011) ("[T]he basic CAPM is still the most widely used method for thinking about required rates of return on stocks.").

II. Determining the Base ROE: FERC Opinion 569

A. FERC Opinion 569 Case History

It is worthwhile to review the relevant legal history leading to FERC Opinion 569 for those unfamiliar with the proceedings. For the thirty years prior to FERC Opinion 531 in June 2014, the Commission based the awarded ROE for electric utilities primarily on a DCF methodology which used only short-term earnings projections.[6] In Opinion 531, when determining the ROE for the New England Transmission Owners ("NETOs"), FERC used a "two-step" DCF methodology where both short and long-term earnings projections were considered.[7] On September 28, 2016, FERC issued Opinion 551 in which the Commission adopted the two-step DCF methodology to calculate the just and reasonable ROE for the MISO TOs. As in Opinion 531, FERC found that anomalous capital market conditions had affected the result produced by the mechanical application of the two-step DCF methodology and set the ROE at the central tendency of the upper half of the zone of reasonableness rather than at the midpoint of the zone of reasonableness. As a result, the base ROE of the MISO TOs, previously 12.38%, was reestablished at 10.32%.[8]

On April 14, 2017, the U.S. Court of Appeals – D.C. Circuit in its *Emera Maine* decision vacated and remanded Opinion 531 along with Opinion 551. The D.C. Circuit Court found that the observation that the NETOs' previously existing base ROE differed from the results of the two-step DCF methodology was not sufficient evidence that the ROE was unjust and

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[6] *Coakley Mass. Attorney Gen. v. Bangor Hydro-Elec. Co*., Opinion No. 531, 147 FERC ¶ 61,234, at P 14 (2014).

[7] *Id.* at P 8.

[8] *Association of Businesses Advocating Tariff Equity v. Midcontinent Independent System .Operator, Inc.*, Opinion No. 551, 156 FERC ¶ 61,234 at P 9 (2016).

unreasonable. Moreover, it was found that the Commission did not adequately justify the decision to set the ROE at the central tendency of the upper half of the zone of reasonableness.[9]

On November 15, 2018, the Commission issued a Briefing Order proposing to address the issues which were remanded in *Emera Maine.* Namely, instead of relying solely on the DCF analysis to determine the ROE, the Commission would consider the results from three additional models, specifically the Expected Earnings methodology, the Risk Premium model, and the CAPM.[10] In Opinion 569, issued on November 21, 2019, FERC disregarded the Expected Earnings and Risk Premium models and used the DCF model and CAPM in its determination, finding the replacement just and reasonable ROE to be 9.88%.[11] Upon rehearing, FERC issued Opinion 569-A on May 21, 2020 and incorporated the Risk Premium model amongst other adjustments, resulting in a just and reasonable ROE of 10.02%.[12]

There are several aspects germane to Opinion 569 which are not addressed in this analysis such as the formation of a sample utility group for purposes of model estimation, the application of outlier tests, whether the ROE should be set at the mean, median, or midpoint of the proxy group estimate, and whether differing weights should be attached across the models used in the final estimate. The focus of this paper is on the spurious application of the standard financial methods rather than discussing issues with such procedural details.

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[9] Opinion No. 569, 169 FERC ¶ 61,129 at PP 7-10 (2019).

[10] *Association of Businesses Advocating Tariff Equity v. Midcontinent Independent System Operator, Inc.*, 165 FERC ¶ 61,118 (2018) (Briefing Order).

[11] *See generally,* Opinion No. 569, 169 FERC ¶ 61,129 (2019). There were two complaints addressed by FERC which resulted in two rulings on the ROE. The First Complaint ("MISO I") was contained in Docket No. EL-14-12-000. Using financial data from January 1 through June 30, 2015, FERC reduced the ROE to 9.88% effective September 28, 2016. The Second Complaint ("MISO II") was contained in Docket No. EL15-45-000. Using financial data from July 1 through December 31, 2015, the Commission found that the 9.88% ROE from MISO I continued to be just and reasonable and awarded no refunds.

[12] Opinion No. 569-A, 171 FERC ¶ 61,154 at P 3 (2020). Similar to Opinion 569, the Commission's finding of a 10.02% base ROE from the First Complaint was not rebutted by the evidence in the Second Complaint.

B. Expected Earnings

Although FERC in Opinion 569 ultimately rejected the use of the Expected Earnings methodology in determining the MISO TOs' ROE, the discussion of the model's proposed inclusion offers insight into the Commission's conceptual framework. FERC described the model as follows:

> A comparable earnings analysis is a method of calculating the earnings an investor expects to receive on the book value of a particular stock. The analysis can be either backward looking using the company's historical earnings on book value, as reflected on the company's accounting statements, or forward-looking using estimates of earnings on book value, as reflected in analysts' earnings forecasts for the company. The latter approach is often referred to as an "Expected Earnings analysis." The Expected Earnings methodology provides an accounting-based approach that uses investment analyst estimates of return (net earnings) on book value (the equity portion of a company's overall capital, excluding long-term debt).[13] [14]

In application, this methodology merely involves taking the average expected return on shareholders' common equity. In equation form:

$$(1)\ \text{Expected Earnings} = \text{Expected ROE} = \frac{\text{Expected Net Income}}{\text{Expected Common Equity}}$$

To develop its estimate, FERC used the average expected return on common equity from its sample utility group in 2018-2020 as reported in the 2015 issues of the Value Line Investment Survey.[15] Notably, as indicated in Table I, the Expected Earnings model returned the highest estimated just and reasonable ROE of the four proposed models.

[13] Opinion No. 569, 169 FERC ¶ 61,129 at P 172 (2019).

[14] Footnotes are omitted from intext citations and block quotes where applicable.

[15] Particularly, May 1; May 22 & June 19, 2015. See Trial Staff Initial Br. (I), Attachment A to App. 2 at 13.

Table I: FERC's Proposed ROE Estimates

Model[16]	Estimate (based on Midpoint except for Risk Premium[17])	
	MISO I	MISO II
CAPM	10.45%	10.49%
DCF	9.52%	9.37%
Expected Earnings	11.18%	11.43%
Risk Premium	10.1%	10.29%

FERC dismissed the Expected Earnings model because of its lack of a market-based measure of price which could measure the opportunity cost of investing in a utility's stock:

> In light of the record in these proceedings as supplemented after issuance of the Briefing Order, we find that there is not sufficient record evidence to conclude that investors rely on the Expected Earnings analysis to estimate the opportunity cost of investing in a particular utility as compared to other companies. As parties have noted, investors cannot purchase equity at book value; therefore, although book value and returns on book equity may be useful data points for investors, they do not reflect an opportunity for investment that can be characterized as an opportunity cost.[18]

Another issue with the Expected Earnings model is its transparent circularity; the anticipated return on equity, the very metric at issue in ROE proceedings, is the single input to the model. In Opinion 551, when justifying the use of the Expected Earnings methodology to

[16] For CAPM, DCF, and Risk Premium results, see Opinion No. 569-A, 171 FERC ¶ 61,154 at Appendix III (2020). For Expected Earnings, see Trial Staff Initial Br. (MISO I), Attachment A to App. 2 at 13 and Trial Staff Initial Br. (MISO II), Attachment A to App. 2 at 13.

[17] Midpoint is the average of the lower and upper end of the zone of reasonableness. In other words, it is the average of the lowest and highest company estimates from the utility proxy group which passed the outlier test. This indeed meant that only two companies informed FERC's estimate for the Expected Earnings, DCF, and CAPM methodologies. The Risk Premium involved a single point estimate; see Section II.C for a review of FERC's Risk Premium methodology.

[18] Opinion No. 569, 169 FERC ¶ 61,129 at P 210 (2019).

corroborate the placement of the ROE above the midpoint of the zone of reasonableness as determined by the DCF model, FERC acknowledged the presence of circularity in the Comparable Earnings methodology, which is the same procedure as Expected Earnings except that it uses historical book returns rather than projected returns. The Commission cited Dr. Roger Morin's *New Regulatory Finance* where Dr. Morin argued against the inclusion of historical book returns of regulated companies in the Comparable Earnings analysis as "It would be circular to set a fair return based on the past actions of other regulators, much like observing a series of duplicative images in multiple mirrors."[19] FERC, however, argued that it mitigated the problem of circularity because the Expected Earnings model uses *forward* estimates of the ROE:

> Dr. Morin's recommendation to avoid other utilities in the sample is based on his concern that the use of historical book ROE would be based on past actions of regulatory commissions and, therefore, reliance on those past actions to set an ROE would raise issues of circularity. However, MISO TOs' expected earnings analysis is forward-looking and based on Value Line forecasts, adjusted to reflect each utility's average return. As the Commission explained in Opinion No. 531-B, an expected earnings analysis, in contrast to a comparable earnings analysis, is sound when it is forward-looking and based on a reliable source of earnings data.[20]

Expectations of future earnings for regulated firms are, of course, inseparable from the expected rate of profit awarded by regulators. As the MISO Complainant-Aligned Parties ("MISO CAPs") explained in their rebuttal testimony:

> As MISO CAPs witness Mr. Solomon explains in his Rebuttal Affidavit, placing reliance on Value Line's projected, or forward-looking, accounting returns on book value does not avoid the undeniable issue of circularity. Value Line's projections for regulated utilities are grounded in existing and expected ROEs

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[19] Opinion No. 551, 156 FERC ¶ 61,234 at P 231 (2016) citing Morin, Roger A., *New Regulatory Finance* (Public Utilities Reports, Inc. 2006), 383.

[20] *Association of Businesses Advocating Tariff Equity v. Midcontinent Independent System Operator, Inc.*, Opinion No. 551, 156 FERC ¶ 61,234 at P 231 (2016). The Commission used the MISO TOs' Expected Earnings analysis to corroborate the finding that the ROE should be placed above the midpoint of the zone of reasonableness determined by the DCF model.

> awarded by the Commission and state commissions, as applicable. Value Line reports, therefore, do not provide projections of future authorized ROEs; instead, the past allowed ROEs provide the basis for future earnings.[21]

In other words, the idea that using a "forward-looking" estimate of future profit for regulated firms somehow ameliorates the self-perpetuating nature of the Expected Earnings model is erroneous given the tautological relationship between the awarded ROE and the expectation of the future ROE; the regulator simply sets the rate of profit which can be expected in future periods. FERC did not address the MISO CAPs' comments on the circularity issue for the Expected Earnings model in Opinion 569. Nonetheless, when the rubber met the road, it is apparent that whatever the Commission held to be "sound" about the Expected Earnings methodology in Opinion 551 was not enough to justify the model's inclusion in determining the ROE in Opinion 569:

> The Commission stated that "The expected earnings analysis, like the other alternative methodologies accepted herein, is merely used as corroborative evidence... which at most can corroborate the Commission's decision to place an ROE above the midpoint of the zone of reasonableness." Here, the question before the Commission is whether to adopt the proposal in the Briefing Order to directly use the results of the Expected Earnings model in the ROE estimate calculations that are the foundation of our ROE analysis. We find that stronger evidence is required to support a decision to include the Expected Earnings model as a direct input in our ROE methodology than is required to merely use it as corroborative evidence for placing an ROE within the zone of reasonableness.[22]

Another revealing aspect of the Expected Earnings adjudication involved the discussion of the market-to-book ("M/B") ratios for the sample utility companies whose financial data was used for model estimation. Dr. J. Randall Woolridge, in his testimony on behalf of the State Complainants in the dockets pertaining to Opinion 531, provided a succinct explanation of the

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[21] Reply Paper Hearing Brief of the MISO Complainant-Aligned Parties in Docket No. EL14-12-003 at 38.

[22] Opinion No. 569, 169 FERC ¶ 61,129 at P 226 (2019).

relationship between the M/B ratio and ROE along with the following graphic (where "K" indicates the cost of equity):

> [T]he relationship between a firm's return on equity, cost of equity, and market-to-book ratio is relatively straightforward. A firm that earns a return on equity above its cost of equity will see its common stock sell at a price above its book value. Conversely, a firm that earns a return on equity below its cost of equity will see its common stock sell at a price below its book value.[23]

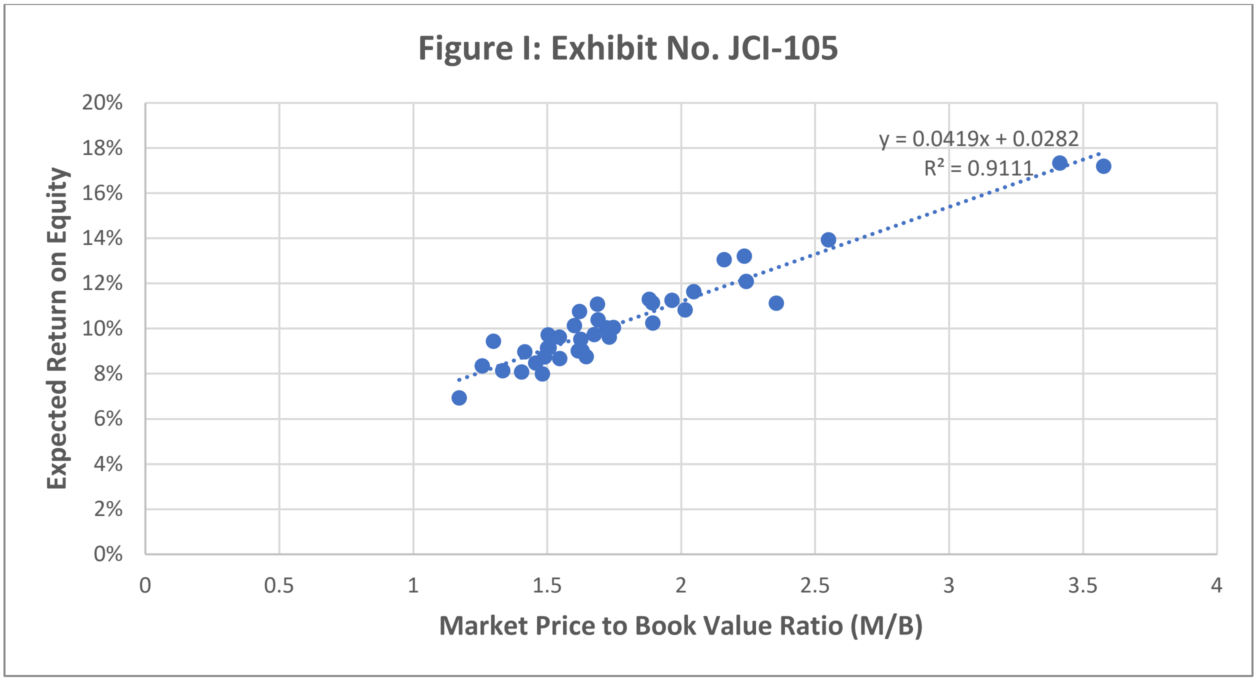
Profitability	**Value**
If ROE > K	then Market/Book > 1
If ROE = K	then Market/Book = 1
If ROE < K	then Market/Book < 1

It follows that utility M/B ratios greater than 1.0 provide evidence that their earnings exceed their cost of capital because of excessive ROEs. Mr. J. Bertram Solomon, in his testimony on behalf of the Joint Complainants and Intervenor in the docket pertaining to Opinion 569, demonstrated that this situation characterized the sample utility firms. As he showed using data from the Value Line Investment Survey, there was a positive linear relationship between the utilities' M/B ratios and their expected ROEs. Additionally, the M/B ratios were clearly above 1.0 with an average of 1.80.[24] This statistically significant model notably predicts that an expected ROE of 7.01% results in an M/B ratio of 1.0.[25]

[23] Testimony of Dr. Randall Woolridge in Docket Nos. EL11-66-000 & EL11-66-000 at 13-14.

[24] Testimony of J. Bertram Solomon in Docket No. EL14-12-002 at Exhibit No. JCI-105.

[25] That is, reverse the roles of x & y in the displayed equation, set y = 1 and solve for x.



FERC rightly acknowledged the fundamental link between the awarded ROE and the market price of a utility's stock when rejecting the MISO TOs' rationale for incorporating the Expected Earnings methodology in determining the ROE:

> The MISO TOs' concerns about market-to-book ratios in excess of one and maintaining the current stock values of public utilities do not justify use of the Expected Earnings model. The Commission is not obligated to set ROEs so as to maintain current stock values. As the Supreme Court held in *Hope*, the "fair value" of a regulated enterprise "is the end product of the process of ratemaking, not the starting point . . . The heart of the matter is that rates cannot be made to depend on 'fair value' when the value of the going enterprise depends upon earnings under whatever rates are anticipated." Consistent with this holding in *Hope*, the Commission has stated, "The market value of an enterprise or its common stock depends upon its earnings or anticipated earnings, which in turn depend upon the rates allowed. Thus, market value is the result of the ratemaking process and may not properly be the beginning of that process as well.[26]

The Commission, however, disavowed that ROE policy should be set so that utilities' M/B ratios are driven towards 1.0:

[26] Opinion No. 569, 169 FERC ¶ 61,129 at P 207 (2019).

> We recognize that, in an environment where the market-to-book ratios of publicly-traded companies are generally above one, it would be unreasonable to adopt an ROE policy that resulted in capital losses for investors in order to drive market-to-book ratios that are currently above one down to one.[27]

Dr. William E. Avera, in his testimony on behalf the MISO TOs in the docket pertaining to Opinion 551, provided the following warning against the complainants' proposed ROEs:

> [T]he cuts to the Base ROE urged by the Opposing Witnesses range from a minimum of 284 basis points to over 350 basis points… The ability of the MISO Transmission Owners to attract and retain capital could be severely compromised, leading investors to view the Commission's regulatory framework as unstable. This would have a long-term, chilling effect on investors' willingness to support future expansion of electric transmission and related infrastructure…[28]

It is difficult to square such alarmism with awarded rates of profit that allowed utility equity to trade, on average, at almost twice the accounting value of the underlying assets. That is, there should not be an issue with lowering the ROE if utilities maintain an M/B ratio greater than or equal to 1.0 as this indicates that the utility earns enough to finance its rate base.[29]

In *New Regulatory Finance*, Dr. Morin attempted to refute the argument that M/B ratios above 1.0 were evidentiary of excessive ROEs:

> The inference that M/B ratios are relevant and that regulators should set an ROE so as to produce an M/B of 1.0 is misguided. The stock price is set by the market, not by regulators. The M/B ratio is the end result of regulation, and not its starting point. The view that regulation should set an allowed rate of return so as to produce an M/B of 1.0 presumes that investors are irrational. They commit capital to a utility with an M/B in excess of 1.0, knowing full well that they will be inflicted a capital loss by regulators. This is certainly not a realistic or accurate view of regulation. For example, assume a utility company with an M/B ratio of 1.5. If investors expect the regulator to authorize a return on book value equal to

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[27] *Id.* at P 208.

[28] Answering Testimony of William E. Avera, PHD, CFA on Behalf of The MISO Transmission Owners in Docket No. EL14-12-002 at 20-21.

[29] David C. Parcell, in *The Cost of Capital – A Practitioner's Guide* (2020, 12), indicated that the Original Cost method is primarily used to determine the rate base, stating, "[Original Cost] is the prevalent measurement technique over the past several decades and reflects the purchase price of plant and equipment net of accumulated depreciation. Original cost is consistent with **accounting values**." Emphasis appears as it is in the source text.

> the DCF cost of equity, the utility stock price would decline to book value, inflicting a capital loss of some 30%. The notion that investors are willing to pay a price of 1.5 times book value only to see the market value of their investment drop by 30% is irrational.[30]

This reasoning misrepresents the significance of M/B ratios in informing the cost of equity, specifically by failing to differentiate between the outcomes of new and existing investors. If the regulator were to set the ROE at a lower rate than previously anticipated by the market, there would obviously be an attendant decrease in the share price. However, with the new ROE known by the market, *new* investors who commit *incremental* capital would not be exposed to a capital loss because the decreased stock price already reflects the expectation of lower profits. The issue is whether the price at which new investors offer their capital is sufficient to cover the utility's required investments; an M/B ratio greater than or equal to 1.0 supports that this criterion is met. It is nonetheless true that existing shareholders will incur a capital loss given that they bought the stock when the regulator was expected to award a higher ROE. However, the goal of ROE proceedings is to ensure that a *fair* rate of return is authorized, not to underwrite existing stock prices. As previously noted, FERC stated "The Commission is not obligated to set ROEs so as to maintain current stock values".

Dr. Morin further inveighed against the role of M/B ratios:

> In an inflationary period, the replacement cost of a firm's assets may increase more rapidly than its book equity. To avoid the resulting economic confiscation of shareholders' investment in real terms, the allowed rate of return should produce an M/B ratio which provides a Q-ratio of 1 or a Q-ratio equal to that of comparable firms. It is quite plausible and likely that M/B ratios will exceed one if inflation increases the replacement cost of a firm's assets at a faster pace than historical cost (book equity). Perhaps this explains in part why utility M/B ratios have remained well above 1.0 over the past two decades. Are we to conclude that regulators have been systematically misguided all across the United States for all these years by awarding overgenerous returns, or are we to conclude that M/B

[30] Morin, *New Regulatory Finance*, 376.

> ratios are largely immaterial in the context of ratemaking? The latter is more likely.[31]

It is indeed the contention of this analysis that the former accurately describes the present situation. To wit, it's unlikely that inflation could have explained the observed M/B ratios when considering, under the predominant methodology of Cost-of-Service regulation, that utility revenue requirements are set so the cost of prudently incurred investment is recovered through rates. It would be unfortunate for ratepayers if inflation caused the replacement cost of the utility's assets, and thereby the revenue requirement, to rise higher than expected, but this is not reason to believe that regulators will prevent the cost recovery of legitimate business expenses. Moreover, it is implausible that replacement costs which are greater than historical book costs could result in "economic confiscation" as the cost of incremental capital is rolled into the rate base and shareholders are allowed a rate of return on the higher-priced invested capital.

In the late 1970s/early1980s, when inflation and interest rates were at record highs, M/B ratios figured more prominently in informing regulation. As Kihm et al. (2015) explained:

> While utilities today have incentives to invest, such was not always the case. In the early 1980s authorized rates of return for utilities were in the 13 to 15 percent range, with earned returns being closer to 10 to 12 percent. The cost of debt (which is lower than the cost of equity) reached levels in excess of 16 percent. Utility stock prices traded as low as half of their underlying book values.
>
> Clearly, the return on equity was less than the cost of equity during this period, creating a disincentive for utilities to make investments. Under these conditions, every dollar the utilities invested tended to increase profits (which depends only on having a positive r), but it also caused their stock prices to decline (because r was less than k). At the time, this raised concerns that rose all the way to Congress about a bias *against* utility investment and led to debate about the possibility of Federal intervention to remedy the problem.[32]

[31] Morin, *New Regulatory Finance*, 377-378. On page 371, the Q-ratio is defined as Q = Market Value of a Firm's Securities / Replacement Cost of a Firm's Assets.

[32] Steve Kihm, Ron Lehr, Sonia Aggarwal, and Edward Burgess, "You Get What You Pay For: Moving Toward Value in Utility Compensation" (June 2015) at 12-13. Available at https://docs.cpuc.ca.gov/PublishedDocs/Efile.

Dr. Morin also emphasized how low market-to-book ratios demonstrated utilities' deteriorating financial health during this period:

> The depressing effect of inflation on utility earnings, dividend, and book value growth was compounded by the necessity to sell stock at prices below book value, which diluted book value and retarded growth further… The utility industry experienced a turnaround in the early 1980s. Inflation abated, utilities were authorized and were earning higher rates of return than in earlier years, and market-to-book ratios increased, so that stock sales no longer diluted book value to the same extent they did earlier.[33]

When considering the foregoing, a pattern becomes apparent whereby M/B ratios below 1.0 indicate that utilities are in a precarious state as they earn below their cost of capital and are used as a justification to raise rates. On the other hand, when the ratio is above 1.0 it is considered insignificant in informing the fair rate of return. Given that M/B ratios signaled regulators to raise ROEs when below 1.0 and that this metric has been consistently above 1.0 since the 1980s,[34] it should be expected that commissions, assuming they were even-handed in their treatment, would consider M/B ratios above 1.0 as indicative of excessive ROEs. Unfortunately, as mentioned beforehand, FERC dismissed this evidence because non-utility stocks are commonly found to trade above their book value. The Commission, however, did not reflect on the appropriateness of comparing the M/B ratios of regulated utilities to the rest of the stock market. Indeed, invoking the high stock price relative to book value of the general stock market as a rationale for dismissing the importance of utility M/B ratios diminishes the credibility of FERC's assertion that it is *not* setting ROE policy so as to maintain share prices.

[33] Morin, *New Regulatory Finance*, 293.

[34] As explained by FERC, "In fact, market-to-book ratios of the proxy companies have been consistently above one since the 1980s, a period during which the Commission solely used the DCF model to determine ROEs." Opinion No. 569, 169 FERC ¶ 61,129 at P 208 (2019).

The argument that M/B ratios are relevant information, however, should not be taken to mean that commissions should rely exclusively on this metric to determine the cost of equity. For one, the use of a proxy group of publicly traded utilities for model estimation, including the group which FERC relied on in Opinion 569, contains nonregulated business which can distort the estimated cost of equity, although this bias applies for the DCF model and CAPM as well. Nonetheless, it would be fair to view M/B ratios as, in the parlance of ROE proceedings, "corroborative" in the sense that the metric informs the efficacy of regulators' approach to setting the allowed rate of return, with M/B ratios greater than 1.0 as indicative that utilities have been allowed to earn more than their cost of equity. At times, an outlier well above (or below) 1.0 might be the result of transient fluctuations in financial markets or a sample issue where the metric is unduly influenced by non-utility business. However, given that M/B ratios have held well above 1.0 for more than three decades, it's unlikely that high M/B ratios could have resulted from such vagaries; regulators have simply allowed a rate of profit that has inflated the market price beyond what is necessary to fund utility assets.

C. Risk Premium

Unlike Expected Earnings, FERC ultimately incorporated the Risk Premium methodology into its determination of the MISO TOs' ROE. The Commission provided the following rationale for the model:

> The risk premium methodology, in which intenrest rates are also a direct input, is "based on the simple idea that since investors in stocks take greater risk than investors in bonds, the former expect to earn a return on a stock investment that reflects a 'premium' over and above the return they expect to earn on a bond investment."[35]

[35] Opinion No. 569, 169 FERC ¶ 61,129 at P 304 (2019).

FERC initially rejected this methodology in Opinion 569 issued in November 2019. However, the Commission reversed course in Opinion 569-A, issued in May 2020, when it included the results from the Rish Premium model in its ruling. As shown in Table I, the ROE estimated from this methodology was higher than the DCF result, so its inclusion had the effect of increasing the ROE awarded from the prior ruling.

As explained by FERC, the basic approach of the Risk Premium methodology is to add a risk premium to the observed cost of debt to compensate equity holders for the incremental risk from investing in a company's stock rather than its bonds. In formula form:

$$(2)\ \mathrm{ROE} = \mathrm{Cost\ of\ Debt} + \mathrm{Risk\ Premium}$$

In FERC's application of the model, the cost of debt was represented by the Baa Utility Bond Yield as reported by Moody's Investors Service. An Implied Risk Premium was determined by subtracting the bond yield from a contemporaneous FERC ruling on the ROE. The Average Risk Premium was computed by averaging over a study period of 71 observations on the Implied Risk Premium from February 2006 to June 2015. The Average Risk Premium was then adjusted to account for the supposed inverse relationship between bond yields and equity risk premia; the adjustment factor added 0.70% to the Average Risk Premium for every 1% decrease between the Baa Utility Bond Yield over the study period and the yield as of June 2015. The awarded ROE was finally determined by adding the Baa Utility Bond Yield as of June 2015 to the Adjusted Risk Premium. A formulaic description of FERC's methodology is as follows:[36]

$$3)\ \mathrm{ROE} = \mathrm{June\ 2015\ Baa\ Utility\ Bond\ Yield} + \mathrm{Adjusted\ Equity\ Risk\ Premium}$$

Where:

$$\mathrm{Adjusted\ Equity\ Risk\ Premium} = \mathrm{Avg.\,Risk\ Premium\ over\ Study\ Period} + \mathrm{Adjustment\ to\ Avg.\,Risk}$$

[36] See MISO I results at Opinion No. 569-A, 171 FERC ¶ 61,154 Appendix I (2020). For convenience, FERC's Risk Premium inputs and results are provided in Exhibit I of the Appendix.

And where:

$$\text{Avg. Risk Premium over Study Period} = \text{Avg. Base ROE} - \text{Avg. Baa Utility Bond Yield}$$

$$\text{Adjustment} = \text{B} * (\text{June 2015 Baa Utility Bond Yield} - \text{Avg. Baa Utility Bond Yield})$$

$$\text{B} = \text{Risk Premium/Interest Rate Relationship}$$

Plugging the MISO I results into the above formulation:

$$10.10\% = \underbrace{4.65\%}_{\text{June 2015 Baa Yield}} + (\overbrace{10.53 - 6.10\%}^{\text{Avg. Risk Premium over Study Period}}) + (\underbrace{-0.7006) * (4.65\% - 6.10\%}_{\text{Adjustment to Avg. Risk}})$$

Combining yield components and simplifying:

$$10.10\% = \underbrace{10.53\%}_{\text{Avg. Base ROE}} + (4.\underbrace{65\% - 6.10\%) + (-0.7006) * (4.65\% - 6}_{\text{Sum of Yield Components}}.10\%)$$

$$10.10\% = 10.53\% - 1.45\% + 1.02\%$$

$$10.10\% = 10.53\% - 0.43\%$$

As shown above, the Adjustment to Average Risk mitigated the difference between the June 2015 and average study period yield so that the impact of the yield terms was minimal; the outcome overwhelmingly resulted from the Average Base ROE which represented FERC's past rulings on the allowed ROE. Notably, as the Risk Premium/Interest Rate Relationship approaches -1, the difference between the result of the Risk Premium model and FERC's historically awarded ROE is virtually eliminated. It's unfortunate that the circularity of the Risk Premium methodology is hidden beneath jargon like the "Implied Cost of Equity" and "Risk Premium/Interest Rate Relationship", but once the equation is broken out into its components, no reasonable person could deny that the model is principally informed by the Commission's past ROE determinations. As with the Expected Earnings model, a tautological relationship occurs where the impending ROE is determined by past regulatory decisions, although under the Risk Premium approach there is a modest interest rate adjustment which is practically muted by the Adjustment to Average Risk.

FERC itself acknowledged the self-fulfilling nature of the Risk Premium model in Opinion 569:

> While all models, including the DCF, feature some circularity, such circularity is particularly direct and acute with the Risk Premium model because it directly relies on past Commission ROE decisions. MISO TOs' regression analysis, discussed below, accentuates such circularity by largely offsetting the effects of changes in interest rates. As a result, we share the concerns expressed by various parties that the circularity inherent in the Risk Premium model's use of prior ROE determinations would largely continue previously-approved ROEs and reflect past circumstances that influenced the previous ROE decisions.[37]

The Commission, however, ruled differently in Opinion 569-A:

> The Commission, in Opinion No. 569, found that the Risk Premium model contained substantial circularity. Upon reconsideration, we agree with MISO TOs and find that, while it contains some circularity, the averaging of the results with those of the DCF and CAPM models sufficiently mitigates that circularity. Additionally, all of the models contain some circularity. And, upon consideration of the rehearing requests, we believe that the level of circularity in the Risk Premium model is acceptable.[38]

It is hard to view FERC's reasoning in the later ruling as anything other than arbitrary and capricious. How can it be that averaging the results of a flawed model with two presumably less-defective models "mitigates" the problems associated with the former model? If the Risk Premium methodology were itself meritorious, FERC should have demonstrated as such without resorting to the conjecture that averaging the model with the DCF and CAPM somehow ameliorates its circularity. Furthermore, the Commission gave no objective standard by which to

[37] Opinion No. 569, 169 FERC ¶ 61,129 at P 343 (2019).

[38] Opinion No. 569-A, 171 FERC ¶ 61,154 at P 106 (2020).

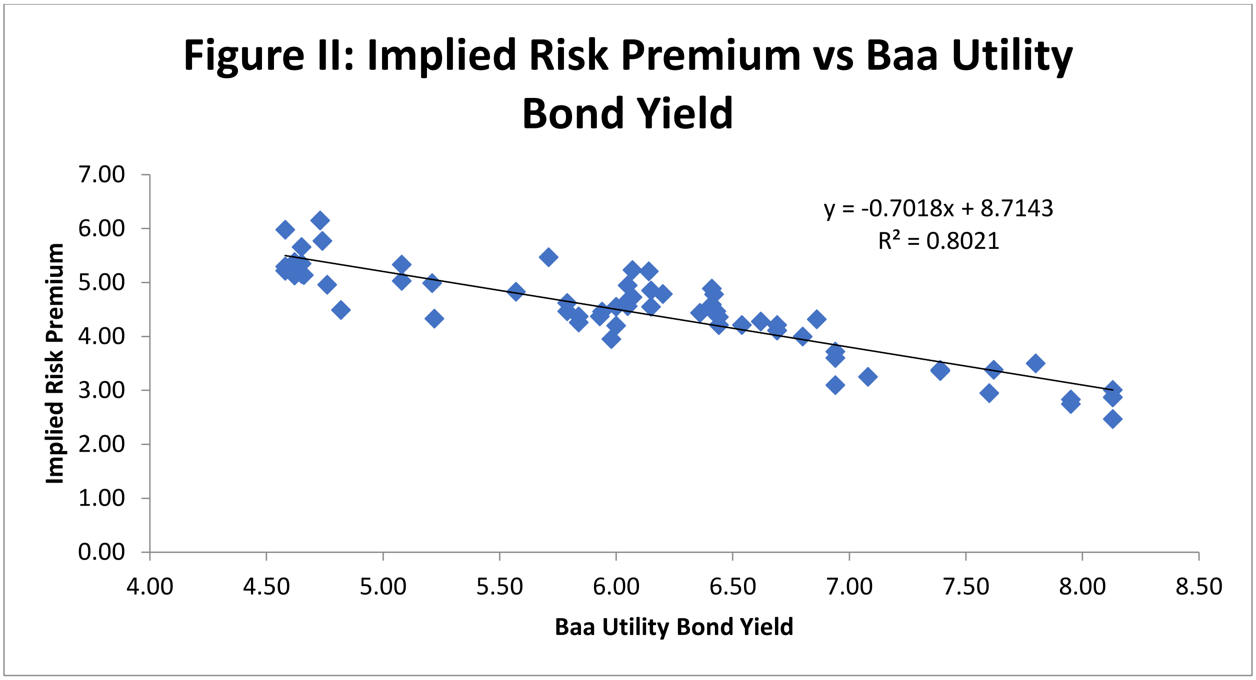
judge how a circular model might be considered “acceptable”. Apparently, FERC’s beliefs alone are enough to determine if an admittedly flawed methodology can be used to award the ROE.

Although the circularity problem renders the Risk Premium model meaningless, except for purposes of anchoring the Commission’s decision on past rulings, FERC’s Adjustment to Average Risk deserves further scrutiny as it functions to further inflate the ROE. The thinking behind the adjustment is that changes in interest rates are inversely related to changes in risk premia. Dr. Morin offered the following support for such an adjustment:

> Published studies by Brigham, Shome, and Vinson (1985), Harris (1986), Harris and Marston (1992, 1993), Carleton, Chambers, and Lakonishok (1983), Morin (2005), and McShane (2005), and others demonstrate that, beginning in 1980, risk premiums varied inversely with the level of interest rates – rising when rates fell and declining when interest rates rose.[39]

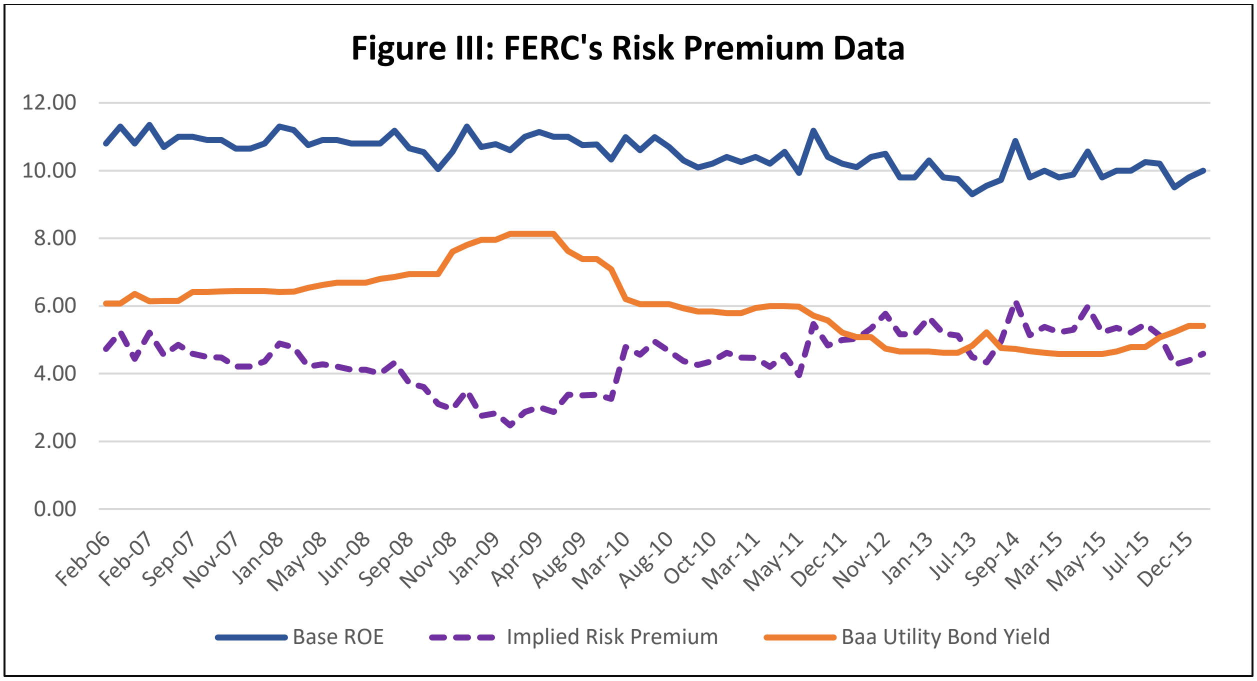
FERC’s approach in Opinion 569-A was to measure this relationship by regressing the Implied Risk Premium on the Baa Utility Bond Yield. The below graph illustrates the regression which was the basis of the inverse Risk Premium/Interest Rate Relationship:

[39] Morin, *New Regulatory Finance*, 128. The criticism of the Risk Premium methodology discussed herein similarly applies to the studies listed.



Considering FERC's instrumental role in determining the Implied Risk Premium as it ruled on the awarded Base ROE and given the circularity of its various approaches to determining the Base ROE, as the Commission itself acknowledged, it should not be a surprise that the regression analysis produced the presupposed result. As FERC affixes the Base ROE to its past rulings while the Baa Utility Bond Yield fluctuates due to prevailing market interest rates, it's obvious that as yields fall the Implied Risk Premium will rise and vice-versa. Figure III provides a time series plot of FERC's Risk Premium data where the inverse pattern is clearly produced by the stationarity of FERC's Base ROE while the Baa Utility Bond Yield fluctuates:[40]

[40] See Exhibit I of the Appendix for FERC's Risk Premium model inputs.



It should be noted that the complainant parties criticized the circularity of the Risk Premium methodology. The Louisiana Public Service Commission highlighted the absurdity of FERC's approach in the following analogy:

> Obviously, if the ROE barely moves, the risk premium will change as the bond yield changes, if the risk premium is defined as the difference between the ROE and the same bond yield. Simple arithmetic produces this result. That would be even more true and statistically significant if the ROE did not change at all. For instance, assume a flag pole outside FERC is 11 feet tall. A "Flagpole Premium" could be computed as the difference between 11 and the annual bond yield. If the results were then plotted, the *fit would be perfect*.[41]

Mr. Michael P. Gorman of the Joint Complainants also questioned the validity of the alleged inverse relationship and noted increased risk premiums during the financial crisis years:

> During the 2007-2010 period, the market paid premiums for low-risk U.S. Treasury securities and demanded higher returns for securities of greater risk. This is evident because the spread between Baa bond yields, a riskier investment than A-rated bonds, and a U.S. Treasury bond, widened during this period. Hence, the market priced higher risk premiums in securities during this time period…

[41] Brief on Behalf of the Louisiana Public Service Commission in Docket No. EL14-12-003 at 33.

> Importantly, these changes in risk premiums are not driven by interest rate changes alone, but rather are impacted by the market's willingness to accept risk, and the risk premiums demanded for higher risk securities.[42]

Indeed, that the trough of the Implied Risk Premium occurred in late 2008/early 2009 casts doubt on the validity of FERC's approach. Contrary to the Commission's findings, it seems likely that the market would have attached a relatively high premium to more risky securities during this episode of volatility. Damodaran (2021) corroborated the view that the implied equity risk premium increased during this time-period:

> During 2008, the S&P 500 lost just over a third of its value and ended the year at 903.25 and the treasury bond rate plummeted to close at 2.21% on December 31, 2008. Firms also pulled back on stock buybacks and financial service firms in particular cut dividends during the year. The inputs to the equity risk premium computation reflect these changes…
>
> The implied premium rose more than 2%, from 4.37% to 6.43%, over the course of the year, indicating that investors perceived more risk in equities at the end of the year, than they did at the start and were demanding a higher premium to compensate.[43]

In light of the foregoing evidence, it's implausible that FERC's Implied Risk Premium could be considered an objective assessment of the true market risk premium over the study period. The Commission's approach led to the spurious conclusion on the inverse Risk Premium/Interest Rate Relationship which unfairly adjusted the estimated cost of equity upwards. Although the Adjustment to Average Risk raised the Risk Premium estimate by 102 basis points, it's important not to forget that the main problem with the model is its overwhelming reliance on the Commission's past decisions. Nonetheless, the inclusion of such

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[42] Affidavit of Michael P. Gorman on behalf of Joint Complainants in Docket No. EL14-12-003 at 33-34.

[43] Aswath Damodaran, "Equity Risk Premiums (ERP): Determinants, Estimation, and Implications – The 2021 Edition" (March 23, 2021). Available at SSRN: https://ssrn.com/abstract=3825823, 86-88.

an unfounded adjustment further underscores the pervasiveness of self-fulfilling logic and generally flawed analysis in the Commission's awarding of the ROE.

D. Discounted Cash Flow

FERC also used the DCF model in its determination of the awarded ROE. The Commission provided the following description:

> The DCF model is based on the premise that an investment in common stock is worth the present value of the infinite stream of dividends discounted at a market rate commensurate with the investment's risk.[44]

This is represented by the following formula:

$$P_0 = \frac{D_1}{(1+k_1)} + \frac{D_2}{(1+k_2)^2} + \cdots + \frac{D_n}{(1+k_n)^n}$$

where: P_0 = current stock price
D_1 = dividends paid in year 1
k_1 = discount rate/investors' required rate of return in year 1
n = infinity

It can be shown that if dividends grow from period-to-period at a constant growth rate, g, then the model reduces to the following:

$$(4) \quad P_0 = \frac{D_1}{k - g}$$

where: P_0 = current stock price
D_1 = dividends paid in year 1
k = discount rate/investors' required rate of return
g = expected growth rate of dividends

Solving for k indicates the required rate of return:

$$(5) \quad k = \frac{D_1}{P_0} + g$$

[44] Opinion No. 569, 169 FERC ¶ 61,129 at P 87 (2019).

Thus, the required rate of return or cost of equity can be determined when given values for the parameters on the right-hand side of equation (5). The D_1/P_0 term is oftentimes referred to as the "dividend-yield". The current stock price, P_0, is widely available from public data sources. As D_1 exists in the future, it is not directly observed and must be estimated. FERC used the following approach in Opinion 569:

> The Commission also multiplies the dividend yield by the expression (1+.5g) to account for the fact that dividends are paid on a quarterly basis. Multiplying the dividend yield by (1+.5g) increases the dividend yield by one half of the growth rate and produces what the Commission refers to as the "adjusted dividend yield." Under the resulting formula, ROE equals the adjusted dividend yield plus the expected future growth rate of dividends and can be expressed as follows:
>
> $k=D/P\ (1+.5g) + g.$[45] [46]

Moreover, it is important to keep in mind that FERC derived its DCF estimate using a group of sample utilities. This is common practice so that the result is not unduly influenced by the vagaries of a sole company's financial data.

As is often the case when the DCF model is litigated in an ROE proceeding, there was disagreement on the expected growth rate of dividends. For the 30 years prior to when Opinion 531 was issued in June 2014, FERC only considered short-term earnings forecasts in its estimation of g. In Opinion 531, to determine g, the Commission adopted the "two-step" DCF methodology which it described as follows:

> Security analysts' five-year forecasts for each company in the proxy group, as published by the Institutional Brokers Estimate System (IBES), are used for determining growth for the short term; earnings forecasts made by investment analysts are considered to be the best available estimates of short-term dividend

[45] *Id.* at P 88.

[46] In Opinion 531, FERC provided further explanation on the calculation of the dividend-yield, "[The two-step DCF] methodology derives a single dividend yield for each proxy group company, using a three step process: (1) averaging the high and low stock prices as reported by the New York Stock Exchange or NASDAQ for each of the six months in the study period; (2) dividing the company's indicated annual dividend for each of those months by its average stock price for each month (resulting in a monthly dividend yield for each month of the study period); and (3) averaging those monthly dividend yields." Opinion No. 531, 147 FERC ¶ 61,234, at P 77 (2014).

> growth because they are likely relied on by investors when making their investment decisions. Long-term growth is based on forecasts of long-term growth of the economy as a whole, as reflected in GDP. The short-term forecast receives a two-thirds weighting and the long-term forecast receives a one-third weighting in calculating the growth rate in the DCF model.[47]

In the dockets pertaining to Opinion 569, the MISO TOs contended for using only the short-term earnings projections for the estimate of g while the various complainants argued to incorporate the long-run component, unsurprisingly as the former growth rate is generally higher. FERC adopted the two-step methodology in Opinion 569, although ultimately in Opinion 569-A the Commission assigned an 80% weighting to the short-term component and 20% to the long-term component, concluding that lower short-term earnings forecasts for utilities made the projection more sustainable than when the two-thirds weight was established for oil and natural gas companies in the 1990s.[48]

As the reader has likely surmised, there are more fundamental problems with using the DCF model as the basis for awarding a fair rate of return than what to use as the constant growth rate of dividends. Namely, the dividend paid by utilities in the forthcoming period and the expected growth rate of utility earnings are inextricably linked to the ROE awarded by regulators. Mr. Adrien M. McKenzie, in his reply affidavit on behalf of the MISO TOs when testifying in favor of the Expected Earnings methodology, provided an accurate assessment on the circularity of the DCF model, even if somewhat unintentionally:

> Moreover, given the importance of the return on equity component of a utility's revenue requirements, virtually every measure of future financial performance—including cash flow measures, profitability, and dividend policies—is impacted by the ROE established by regulators. As a result, the projections of earned returns used to apply the Expected Earnings approach are no more susceptible to concerns over regulatory influence (past, present, or future) than the analysts' EPS growth rates reported by IBES. If analysts' estimates are rendered unusable

[47] Opinion No. 531, 147 FERC ¶ 61,234, at P 17 (2014).

[48] Opinion No. 569-A, 171 FERC ¶ 61,154 at P 57-58 (2020).

> because they are, in part, a function of expectations regarding future allowed ROEs, under Dr. Berry's and the LPSC's own logic, the DCF model must be rejected as well. This is misguided and the Commission should dismiss such arguments.[49]

Mr. McKenzie said nothing further about why it would be "misguided" to dismiss the DCF model on the same basis which invalidated the Expected Earnings model. His reasoning was likely meant to appeal to the sanctity of the Commission's historically preferred approach to awarding the ROE. After all, implicit in FERC's acceptance of the DCF analysis for over thirty years is that expectations formed upon regulators' decisions are a legitimate basis for determining the ROE in impending rate cases. From this perspective, it's sensible to equate the applicability of the Expected Earnings model with the DCF model. The problem with Mr. McKenzie's reasoning, however, was that neither methodology should have ever been considered justified. In truth, the Commission's judgement on the Expected Earnings methodology similarly applies to the DCF model. As seen in equation (4), the presence of the market value of utility stock, P_0, which "depends upon its earnings or anticipated earnings, which in turn depend upon the rates allowed",[50] makes the DCF model fundamentally endogenous; the market valuation P_0, nor the parameters D_1 or g, simply cannot be separated from the anticipated ROE awarded by regulators. Given that P_0, D_1, and g result from regulation, solving for k merely reflects the outcome of said regulation.

Dr. Morin attempted a defense against the circularity criticism:

> The circularity problem is somewhat dampened by the self-correcting nature of the DCF model. If a high equity return is granted, the stock price will increase in response to the unanticipated favorable return allowance, lowering the dividend yield component of market return in compensation for the high g induced by the high allowed return. At the next regulatory hearing, more conservative forecasts

[49] Reply Affidavit of Adrien M. McKenzie, CFA on behalf of the MISO Transmission Owners in Docket Nos. EL14-12-000 & EL15-45-000 at 72.

[50] Opinion No. 569, 169 FERC ¶ 61,129 at P 207 (2019).

> of r would prevail. The impact on the dual components of the DCF formula, yield and growth, are at least partially offsetting.[51]

Dr. Morin nonetheless acknowledged the circularity issue in the following passage:

> One of the leading experts on regulation, Dr. C. F. Phillips, discussed the dangers of relying on the DCF model:
>
> > [T]here remains the circularity problem: Since regulation establishes a level of authorized earnings which, in turn, implicitly influences dividends per share, estimation of the growth rate from such data is an inherently circular process. For all of these reasons, the DCF model suggests a degree of precision which is in fact not present and leaves wide room for controversy about the level of k [cost of equity].[52]

The "self-correcting nature of the DCF model" is worth further consideration. It is true that an increase in the allowed ROE could increase P_0 in equation (5) by enough to offset attendant increases in D_1 and g, thereby leaving k unchanged. Likewise, a decrease in P_0 could cancel out a lower D_1 and g. This situation is akin to a regulator awarding an atypically high or low ROE to one utility relative to other similar utilities. Here, assuming all else constant, the impact of the change in the ROE is likely to be accounted for in the affected utility's P_0, D_1, and g as the market's overall expected rate of return on utility equity, k, remains unaltered.[53] However, let us consider the other extreme where, for every rate case in the upcoming year throughout the nation, the presiding utility commission arbitrarily awards an ROE of 15% when the average was previously 10%, even though capital markets and other conditions are expected to be unchanged. The utilities afforded a rate increase will see the value of their common stock rise because of increased earnings. Like a bond selling at a discount to par value, the stock price

[51] Morin, *New Regulatory Finance*, 307.

[52] *Id.*, 431.

[53] However, if the prevailing authorized ROEs for utilities are excessive, an atypically low ROE does not mean that the utility receives less than what is required to fund its assets. See the discussion of market-to-book values in Section II.B Expected Earnings.

of the utilities remaining at the lower 10% rate will decrease because the overall expected return has been pulled towards the higher 15%. If an analyst were to use the DCF methodology to estimate the cost of equity for utilities using the financial data from this market, they would see an increased estimate for the current year relative to the prior year. This result is rather intuitive; as FERC stated, the DCF model is based on the premise that common stock is worth the present value of dividends discounted at the expected rate of return. It follows that if regulators allow higher ROEs, assuming all else constant, this will result in a higher expected rate of return on utility stock and utility earnings will be discounted at an accordingly higher rate in a DCF analysis.

In fairness, although the estimate from the DCF model depends on regulatory outcomes, there is a degree of objectivity which is not present in either the Expected Earnings or Risk Premium methodology as the common stock price at least somewhat reflects investors' required return throughout the capital markets. Namely, the k in the DCF model correlates with prevailing interest rates in the economy. After a low interest rate environment occurred in the aftermath of the 2008/2009 financial crisis, the DCF model indicated a lower cost of equity compared to earlier periods. It was these capital market conditions which prompted the Commission to question the reduced estimate from the DCF model. Per the Briefing Order:

> [T]he 10-year U.S. Treasury bond rates, beginning with the recession of 2008/2009 and continuing through the periods at issue in these proceedings, are the lowest since the early 1960s…
>
> In Opinion No. 551, the Commission relied on the low 10-year U.S. Treasury bond yields during the January to June 2015 period to find that capital market conditions were "anomalous" during that period. The Commission found that, in those circumstances, the Commission had "less confidence" that the midpoint of the zone of reasonableness determined by the DCF analysis satisfied the *Hope* and *Bluefield* capital attraction standards. The Commission then considered the alternative cost of equity models to corroborate the Commission's determination

> to set MISO TOs' ROE "at a point above the midpoint" of the DCF analysis' zone of reasonableness, i.e., the midpoint of the upper half of the zone.[54]

The Commission further noted the "model risk" posed by the DCF result in the Briefing Order:

> We also note that, in recent years, utility stock prices appear to have performed in a manner inconsistent with the theory underlying the DCF methodology. Under that theory, increases in a company's actual earnings or projected growth in earnings would ordinarily be required to justify an increase in the company's stock price. However, as described in the *Coakley* Briefing Order, although the Dow Jones Utility Average increased by almost 70 percent from October 1, 2012 through December 1, 2017, there was not an increase in either utility earnings or projected earnings during that period that would justify the substantial increase in stock prices. This is an example of what MISO TOs have described as "model risk" —the risk that in some circumstances a model will produce results that do not reflect real world experience. It appears that, for whatever the reason, investors have seen greater value in utility stocks than the DCF methodology would predict. This suggests that the ROE estimated by that methodology may be correspondingly inaccurate.[55]

As various complainants rightfully noted, FERC inexplicably did not account for the k part of the DCF model in the above analysis. Of course, if the market discount rate falls, then the stock price can rise without a change in expected earnings. A cursory overview of the capital markets during this time-period would have revealed that investors sought higher yields in riskier equity over bonds because interest rates were so low. FERC in Opinion 569, however, did not admit to its mistake in the Briefing Order and noted only that:

> [T]he issue of whether the low-interest rate capital market conditions during 2015 were "anomalous" or may have distorted the results of the DCF model are not relevant to our revised approach… we are averaging the results of the DCF and CAPM models to determine a composite zone of reasonableness and setting the ROE… There is thus no need to find that low-interest rate capital market conditions distort the results of a DCF analysis…[56]

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[54] Briefing Order, 165 FERC ¶ 61,118 at P 45.

[55] *Id.* at 47.

[56] Opinion No. 569, 169 FERC ¶ 61,129 at P 170 (2019).

Although FERC in Opinion 569 ducked the question of whether "anomalous" conditions caused the DCF estimate to become inaccurate, the Commission's framing of the low interest rate environment is yet another way in which the awarded ROE has been biased upwards over the past decade. In both Opinions 531 and 551, FERC found that the "anomalous" capital market environment caused it to have "less confidence" about the result from the midpoint of the DCF analysis. When pressed by the complainants on what specifically led to this doubt, FERC offered the following explanation:

> [A] direct causal analysis linking specific capital market conditions to particular inputs or assumptions in the DCF model is not necessary. Consistent with Opinion No. 531, we find that the DCF methodology is subject to model risk of providing unreliable outputs in the presence of unusual capital market conditions. The Commission has not required a mathematical demonstration of how each anomalous capital market condition specifically distorts the DCF analysis and it is uncertain whether such an analysis is even possible given the complexities of capital markets and how various phenomena could affect the DCF methodology results. For that reason, in the presence of anomalous capital market conditions, the Commission examines other evidence, namely the results of alternative methodologies and state-commission approved ROEs to assess the reasonableness of the results of the DCF methodology. We find that the record contains sufficient evidence of anomalous capital market conditions.[57]

As stated above, FERC could not point to anything concretely problematic with the DCF model in and of itself, that the DCF result appeared "unreliable" to the Commission was essentially a value judgement that relatively low ROE estimates are inherently distorted. In other words, there was no objective reason for choosing to associate the DCF analysis with "model risk" and not the other methodologies. Given the historically low costs of capital under consideration, a more reasonable interpretation of the evidence would have been that the models *besides* the DCF analysis were distorted because they did *not* appropriately account for changes in interest rates. In Opinion 569, after more than a decade of low yields, it would have been

[57] Opinion No. 551, 156 FERC ¶ 61,234 at P 125 (2016).

untenable for FERC to claim that “anomalous” conditions affected the DCF result, so the Commission dropped this pretext and claimed that it was necessary to consider other models. To be sure, had FERC correctly diagnosed the prevailing market conditions in Opinions 531 and 551, it would have lost its justification to place the awarded ROE above the DCF midpoint and to “corroborate” that placement using other methods which were even more flawed than the DCF model.

In summary, the main problem with the DCF analysis is its innate circularity. The model has nonetheless retained a prominent role in ROE proceedings and its adjudication mainly involves issues of implementation. In fact, even the MISO CAPs argued that the DCF analysis should primarily determine the awarded ROE.[58] Nonetheless, although use of the DCF model to estimate the fair ROE is commonly taken as an article of faith, the self-fulfilling nature of the methodology is apparent when considering the fundamental role of the regulator in determining the model’s inputs. Although the DCF model is circular, as FERC obliquely acknowledged when recalling its statement that “all of the models contain some circularity”, there is an element of objectivity in the method which is not present in the Expected Earnings or Risk Premium analysis as the opportunity costs of alternative investments are impounded in the common stock price. Unfortunately, this modicum of truth, which suggested a relatively low cost of equity for the period under consideration because of low interest rates, was buried by FERC when it suggested in Opinions 531 and 551 that, despite several years of evidence to the contrary, capital market conditions were “anomalous”. This assertion led to the diminishment of the model’s traditional role in determining the ROE, thereby unfairly negating the effect that historically low interest rates should have had on the final ruling.

[58] Initial Paper Hearing Brief of the MISO Complaint-Aligned Partied in Docket No. EL14-12-003 at 12-13.

E. Capital Asset Pricing Model

The remaining model to discuss in FERC's Opinion 569 is the CAPM. FERC provided the following description:

> Investors use CAPM analysis as a measure of the cost of equity relative to risk. The CAPM methodology is based on the theory that the market-required rate of return for a security is equal to the risk-free rate, plus a risk premium associated with the specific security. Specifically, the CAPM methodology estimates the cost of equity by taking the "risk-free rate" and adding to it the "market-risk premium" multiplied by "beta." The risk-free rate is represented by a proxy, typically the yield on 30-year U.S. Treasury bonds. Betas, which are published by several commercial sources, measure a specific stock's risk relative to the market. The market risk premium is calculated by subtracting the risk-free rate from the expected return. The expected return can be estimated either using a backward-looking approach, a forward-looking approach, or a survey of academics and investment professionals. A CAPM analysis is backward-looking if the expected return is determined based on historical, realized returns. A CAPM analysis is forward-looking if the expected return is based on a DCF analysis of a large segment of the market. Thus, in a forward-looking CAPM analysis, the market risk premium is calculated by subtracting the risk-free rate from the result produced by the DCF analysis.[59]

The traditional CAPM is represented by the following equation:

$$(6)\ R_i = R_f + B_i * (R_m - R_f)$$

where: R_i = expected return of stock i
R_f = risk-free rate of return
B_i = beta of stock i
R_m = expected market return
$R_m - R_f$ = market risk premium

In Opinion 569, FERC added a "size premium adjustment" to the traditional model to account for the alleged riskiness of small stocks over large stocks. In formula form:

$$(7)\ R_i = R_f + B_i * (R_m - R_f) + SPA$$

[59] Opinion No. 569, 169 FERC ¶ 61,129 at P 229 (2019).

In comparison to the prior models, the CAPM is relatively free from regulator influence. The risk-free rate and market risk premium are parameters determined independently of the equity investment under consideration. The beta is the correlation between the utility stock return and the market return.[60] The regulator can be seen to influence beta through the utility stock return but its effect is ambiguous because of the presence of the market return. In other words, the pathologies stemming from the circularity of outcomes which pervade the previously described methodologies do not afflict the CAPM. Dr. Morin also reflected favorably on this aspect of the CAPM, stating, "On the positive side, as a tool in the regulatory arena, the CAPM is a rigorous conceptual framework, and is logical insofar as it is not subject to circularity problems, since it inputs are objective, market-based quantities, largely immune to regulatory decisions."[61] Given the advantages of the CAPM, it is reasonable for regulators to adopt this methodology in determining the fair ROE. However, FERC's approach in Opinion 569 involved the misspecification of all the traditional CAPM parameters as well as the untoward inclusion of the size premium adjustment. Each of these issues is discussed in detail in the below subsections.

1. Risk-Free Rate and the Market Risk Premium

It is useful to consider the risk-free rate and the market risk premium together as these parameters similarly do not rely on utility-specific data, moreover the market risk premium is the expected market return minus the risk-free rate. A typical approach for the risk-free rate is to use the yield on U.S. Treasury debt. FERC adopted the following methodology in Opinion 569:

> We find that the evidence supporting the use of the 30-year U.S. Treasury average historical bond yield over a six-month period as the risk-free rate outweighs the evidence supporting the use of the 20-year U.S. Treasury yield. RPGI is the only

[60] Specifically, beta is the covariance between the equity return and market return divided by the variance of the market return.

[61] Morin, *New Regulatory Finance*, 443.

> party to propose using the 20-year U.S. Treasury yield and the other evidence and precedent provides greater support for using the 30-year U.S. Treasury yield. Accordingly, we adopt use of the 30-year U.S. Treasury average historical bond yield over a six-month period as the risk-free rate.[62]

Thus, based on the average yield on 30-year U.S. Treasury bonds from January-June 2015, FERC used a risk-free rate of 2.69% in the CAPM.[63] It is unfortunate that the Commission's approach was given little challenge as the selection of the yield on 30-year U.S. Treasury bonds, which is the longest-term maturity offered, meant that the highest rate on the U.S. Treasury yield curve, which most always slopes upward as the term to maturity increases, was used as the risk-free rate. For example, the yield on 10-year and 20-year U.S. Treasury debt over the same period was 2.07% and 2.47%, respectively.[64]

As for the evidence which supported using the yield on 30-year U.S. Treasury bonds, FERC cited Dr. Morin:

> At the conceptual level, because common stock is a long-term investment and because the cash flows to investors in the form of dividends last indefinitely, the yield on very long-term government bonds, namely, the yield on 30-year Treasury bonds, is the best measure of the risk-free rate for use in the CAPM and Risk Premium methods. The expected common stock return is based on long-term cash flows, regardless of an individual's holding time period. Utility asset investments generally have long-term useful lives and should be correspondingly matched with long-term maturity financing instruments.[65]

There are reasons to doubt this analysis. Unlike short-term Treasury yields, the yields from long-term Treasury bonds include a premium to compensate for interest rate risk, so they are not "risk-free" in the truest sense. As explained in *Principles of Corporate Finance* by Brealey,

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[62] Opinion No. 569, 169 FERC ¶ 61,129 at P 88 (2019).

[63] Trial Staff Initial Br. (I), Attachment A to App. 2 at 6.

[64] See "10-Year Constant Maturity Rate", FRED Economic Data, https://fred.stlouisfed.org/series/DGS10 and "20-Year Constant Maturity Rate", FRED Economic Data, https://fred.stlouisfed.org/series/DGS20.

[65] Opinion No. 569, 169 FERC ¶ 61,129 at P 237 (2019) citing Morin, *New Regulatory Finance*, 151-152.

Myers, and Allen, given uncertainty about Treasury bill rates in future periods, investors oftentimes use a Treasury bond yield as the risk-free rate.[66] However, this does not imply that investors are inclined to view the yield from the longest-term Treasury security as the risk-free rate. Deeming the yield on the 30-year Treasury bond as "the best measure of the risk-free rate" is essentially just a way to tack on a few basis points to the ROE by incorporating the highest possible proxy for the risk-free interest rate in the CAPM.

FERC gave the following description on its approach to the market risk premium:

> We continue to find reasonable the MISO TOs' proposal to estimate the CAPM expected market return using a forward-looking approach, based on applying the DCF model to the dividend paying members of the S&P 500. Using a DCF analysis of the dividend-paying members of the S&P 500 is a well-recognized method of estimating the expected market return for purposes of the CAPM model. The DCF analysis must be limited to the dividend-paying members of the S&P 500, rather than using all companies in the S&P 500, because a DCF analysis can only be performed on companies that pay dividends.[67]

At issue was whether the application of the DCF methodology on the S&P 500 companies would involve a "two-step" approach where the growth rate, g, would blend both short-term and long-run projections of future earnings as was done when FERC used the DCF model to estimate the cost of equity for the sample utilities, or a "one-step" approach where only short-term projections are used. FERC offered the following explanation for its decision to adopt the one-step procedure for the CAPM:

> In summary, while it may be unreasonable to expect an individual company to sustain high short-term growth rates in perpetuity, the same cannot be said for a broad representative market index that is regularly updated to include new companies. Put differently, a portfolio of companies behaves differently than an individual company. Accordingly, the rationale for incorporating a long-term growth rate estimate in conducting a two-step DCF analysis of a specific utility or

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[66] Richard Brealey, Stewart Myers, Franklin Allen, *Principles of Corporate Finance,* 13th ed. (New York, NY: McGraw-Hill Education, 2020), 235.

[67] Opinion No. 569, 169 FERC ¶ 61,129 at P 260 (2019).

> group of utilities for purposes of directly estimating cost of equity does not apply to the DCF analysis of a broad representative market index with a wide variety of companies that is regularly updated to include new companies for purposes of determining the required return to the overall market.[68]

It's hard to see how the foregoing could explain away the incoherency between applying the two-step DCF when estimating the expected return for the sample utility companies and the one-step DCF when estimating the expected return from the dividend-paying S&P 500 companies for use in the CAPM. The Commission in fact cited the following passage from Dr. Morin in support of the two-step approach for its DCF analysis of the sample utilities:

> The problem is that from the standpoint of the DCF model that extends into perpetuity, analysts' horizons are too short, typically five years. It is often unrealistic for such growth to continue into perpetuity. A transition must occur between the first stage of growth forecast by analysts for the first five years and the company's long-term sustainable growth rate... It is useful to remember that eventually all company growth rates, especially utility service growth rates, converge to a level consistent with the growth rate of the aggregate economy.[69]

It was wholly inconsistent for FERC to initially observe that the growth rates of "all" companies converge to that of the overall economy and subsequently ditch this assertion when calculating the expected return for the dividend-paying companies in the S&P 500. Furthermore, a tenet of the CAPM is that the expected market rate of return is a proxy for the entire investment market. Even if one were to concede the Commission's dubious argument that the S&P 500 can indefinitely sustain higher growth rates than that of the overall economy, the point would be moot because the market risk premium used in the CAPM is a proxy for the entire investment market and it was already found that the growth rate of the investment market is constrained by underlying economic growth. FERC's contradictory approach in its use of the one-step DCF

[68] *Id.* at P 266.

[69] Opinion No. 569, 169 FERC ¶ 61,129 at P 152 (2019) citing Morin, *New Regulatory Finance*, 308.

analysis led to an estimated market return of 11.81%, subtracting the risk-free rate of 2.69% resulted in a 9.12% market risk premium used in the CAPM. The two-step procedure gave an estimated market return of 10.30% which, after subtracting the risk-free rate, indicated a 7.61% market risk premium.[70]

Beyond the debate on the growth rate of dividends, a more fundamental problem is the misalignment between FERC's accepted market risk premium and the market risk premium used by investors. Although the MISO CAPs identified authorities which reported a much lower expected market risk premium than that applied by FERC, the Commission dismissed these observations:

> [The MISO CAPs] cite a PIMCO report calculating a forward-looking equity risk premium of 3.9 percent calculated by comparing the projected 10-year return of the S&P 500 to inflation protected 10-year treasury bonds. They also state that the American Appraisal Risk Premium Quarterly calculated a forward-looking risk premium of 6.0 percent, Duff & Phelps calculated a forward-looking risk premium of 5.0 percent, and *Value Line* estimated that the required equity premium above the yield on ten-year bonds in order to induce investment in corporate equity was about 5.5 percent.
>
> There are a variety of views as to the reasonable market risk premium to include in a CAPM study and what method to use to determine that premium, as is clear from Dr. Morin's summary of academic studies of both historical and prospective market risk premiums. Dr. Morin concludes that "Faced with this myriad, and often conflicting, evidence on the magnitude of the risk premium, a regulator might very well be confused about the correct market risk premium." Although the risk premiums we approve in this order exceed those of certain other analyses, we find that their determination is analytically sound and supported by the evidence in this proceeding.[71]

The issue with this reasoning was that it was not just "certain other analyses" which caused FERC's market risk premium of 9.12% to appear unduly high. In addition to the credible

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[70] Trial Staff Initial Br. (I), Attachment A to App. 2, two-step at 4 and one-step at 6.

[71] Opinion No. 569, 169 FERC ¶ 61,129 at P 272-273 (2019).

data provided by the MISO CAPs, the preponderance of evidence at this time suggested that FERC's estimate was an extreme outlier. Graham and Harvey (2015) examined survey data of 414 U.S. CFOs and, where the equity risk premium was defined as the expected 10-year S&P 500 return relative to a 10-year U.S. Treasury bond yield, found that the 10-year equity risk premium was 4.51%.[72] Fernandez, Ortiz Pizarro, and Fernandez Acin (2015) conducted a survey on the risk-free rate and market risk premium used by academics and financial professionals for various international markets. Based on 1,983 survey responses for the U.S., the average market risk premium was 5.5% while the average risk-free rate was 2.4%.[73] [74]

Such results beg the question: what caused FERC's estimate to be significantly higher than that indicated by the broad investment community? After all, discarding the absurdly high 9.12% market risk premium from the one-step DCF analysis still leaves a discrepancy between the 7.61% market risk premium from the two-step DCF analysis and the range of 4-6% used by most market participants in 2015. The likely answer is that taking the expected returns from only dividend-paying companies biased the estimate upwards. Stocks with high growth potential which don't pay a dividend oftentimes have a high price-to-earnings ratio which is analogous to the inverse of the dividend-yield in the DCF model. The effect of incorporating these non-dividend paying firms which trade at a high price relative to earnings could be to reduce the

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[72] John R. Graham and Campbell R Harvey, "The Equity Risk Premium in 2015" (October 1, 2015). Available at SSRN: https://ssrn.com/abstract=2611793 at 7 (Table 1).

[73] Pablo Fernandez, Alberto Ortiz Pizzaro, and Isabel Fernandez Acin, "Discount Rate (Risk-Free Rate and Market Risk Premium) Used for 41 Countries in 2015: A Survey" (October 17, 2017). Available at SSRN: https://ssrn.com/abstract=2598104 at 3 (Table 2 – Market Risk Premium) and 4 (Table 3 – Risk Free Rate).

[74] The authors provided the following description of their survey methodology at 2.: "We sent a short email (see exhibit 1) on the period March 15 - April 10, 2015 to about 22,500 email addresses of finance and economic professors, analysts and managers of companies obtained from previous correspondence, papers and webs of companies and universities. We asked about the Risk Free Rate and the Market Risk Premium (MRP) used 'to calculate the required return to equity in different countries'."

overall expected return from the sample of dividend payers. For example, Damodaran (2021) determined the equity risk premium by using the expected free cash flow to equity instead of expected dividends in a DCF-style analysis. This allowed for inclusion of the entire S&P 500 in the estimate, resulting in a 5.78% equity risk premium at the start of 2015.[75] Whether sample bias, differences in methodology, or a combination thereof caused the discrepancy between FERC's estimate of the market risk premium and that used by the typical market participant, the important point is that the objective evidence supports that the Commission adopted an excessively high parameter.

If FERC were to appropriately reconsider its approach to the market risk premium based on the investment community's assessment, utility witnesses would likely impugn the reliance on surveys or other public data. For instance, Dr. Morin offered a criticism on the use of surveys to determine the market risk premium:

> There are several reasons to place little weight on survey results relative to the results from other approaches. First, return definitions and risk premium definitions differ widely. Second, survey responses are subject to bias. Surveys may tell more about hoped-for expected returns rather than objective required returns. Third, subjective assessments about long-term market behavior may well place undue weight on recent events and immediate prospects.[76]

It would be improper for regulators to dismiss evidence on the market risk premium from survey data or other financial authorities based on these assertions. For one, in the DCF model, FERC explicitly incorporated the financial industry's consensus on utilities' expected earnings growth by relying on IBES estimates. As the Commission explained in Opinion 569:

> IBES compiles the growth projections of a number of analysts at different

[75] Aswath Damodaran, "Equity Risk Premiums (ERP): Determinants, Estimation, and Implications – The 2021 Edition" (March 23, 2021). Available at SSRN: https://ssrn.com/abstract=3825823, at 91-92.

[76] Morin, *New Regulatory Finance*, 161-162.

> brokerage and investment firms. The IBES growth projections thus generally represent an average of projections made independently of one another by a number of analysts at different institutions. Data sources can reflect investor expectations by being used by large numbers of investors and/or being themselves the results of the analysis of a diverse group of persons in the investment community. Both IBES and *Value Line* growth rates are used by large numbers of investors but only IBES growth rates reflect the analysis of a diverse group of persons in the investment community.[77] [78]

In essence, survey data on market participants' expectations for the market risk premium provides the same function as the use of IBES earnings growth forecasts in the DCF model. In each case, a key financial parameter is averaged across a wide swath of investors to determine a consensus estimate which is employed in the determination of the cost of equity. FERC also cited the following from Dr. Morin in support of the IBES growth rates:

> Exclusive reliance on a single analyst's growth forecast runs the risk of being unrepresentative of investors' consensus forecast. One would expect that averages of analysts' growth forecasts, such as those contained in IBES or Zacks, are more reliable estimates of investors' consensus expectations likely to be impounded in stock prices. Averages of analysts' growth forecasts rather than a single analyst's forecasts are more reliable estimates of investors' consensus expectations.[79]

In contrast, the Commission ignored the consensus in its implementation of the CAPM by calculating its own estimate of the forecasted market return, essentially a single analyst's estimate, without checking if this at all aligned with the expectations of actual investors. By FERC's logic in Opinion 569, grounding financial models on the consensus expectations of market participants is important when using the DCF model to determine the utility cost of equity but can be disregarded when developing the market risk premium in the context of the CAPM. This double standard reveals the capriciousness of the Commission's approach.

[77] Opinion No. 569, 169 FERC ¶ 61,129 at P 125 (2019).

[78] In the Second Complaint proceeding, the MISO TOs proposed the use of Value Line estimates of expected earnings growth in place of IBES growth estimates, but this was rejected by FERC in Opinion 569 as the estimate only reflected the forecast of a single institution.

[79] Opinion No. 569, 169 FERC ¶ 61,129 at P 126 (2019) citing Morin, *New Regulatory Finance* at 302.

Nonetheless, even though objective evidence on the average investor's market risk premium makes FERC's estimate transparently excessive, utility advocates may argue in the same manner as Dr. Morin that because surveys contain risk premium definitions which "differ widely" and/or "are subject to bias", they cannot inform the CAPM. Such assertions should not be viewed credibly if made. For one, FERC's approach is "subject to bias" in an apparent way from having left out a significant portion of the S&P 500 in the non-dividend paying companies. Furthermore, even if there are slight differences in the definition of the market risk premium used by the aforementioned references, this cannot possibly explain the chasm between the survey results of 4-6% and the 9.12% used by the Commission. If, as according to Dr. Morin, "surveys tell more about hoped-for expected returns" then it must be that FERC was positively jubilant in its assessment of future market performance. The Commission's hand-waving dismissal of this discrepancy only served to ensure that investor expectations did not factor into the CAPM while contradictorily alleging the importance of incorporating investor expectations elsewhere in determining the cost of equity.

It is worth further reflecting on the difference between investors' expected market return and the ROE ultimately awarded by FERC. Taking the results from Fernandez, Ortiz Pizarro, and Fernandez Acin (2015) as representative of market expectations, adding the risk-free rate of 2.4% to the 5.5% market risk premium results in an expected market return of 7.9%, while FERC's awarded ROE for the MISO TOs in Opinion 569-A was 10.02%.[80] As dictated by

[80] In FERC's midpoint methodology, the average of the highest and lowest estimates from the zone of reasonableness determined the result for the CAPM. Using the CAPM data provided by the Trial Staff (see Exhibit III of the Appendix), under a Risk Premium of 9.12%, the highest estimate was 13.09% from Black Hills Corp. while the lowest estimate was 7.8% from Duke Energy Corp. (or equivalently Southern Co.). Using the Fernandez (2015) market risk premium of 5.5% results in an average estimate of 7.64% while the average is 10.45% under FERC's approach. As such, the effect of using FERC's unrealistically high Risk Premium was to raise the CAPM estimate by ~280 basis points.

common sense given the inherent safety of utility investments afforded by a government-granted monopoly franchise, an assertion supported by historical utility betas of well less than 1.0 as shown in the following subsection, investors' expected market return should effectively set a ceiling on the ROE approved by regulators as utility stock is less risky than the overall stock market. It follows that it was simply unreasonable for the Commission to find that the cost of equity for the MISO TOs was more than 200 basis points higher than the rate of return required for an average stock. To reiterate, defenders of FERC's methodology would likely attempt to impugn the reliability of the 7.9% expected market return suggested by the survey data, but there would be no reason to reject the preponderance of evidence which suggested that the 7.9% rate was a reasonable estimate in favor of the Commission's biased approach.

2. Utility Betas

In addition to the risk-free rate and market risk premium, the other key parameter in the implementation of the traditional CAPM is beta, the B_i term in equation (6). FERC provided the following description of beta in its Briefing Order:

> The CAPM provides a market-based approach determined by beta, a measure of the risk based upon the volatility of a company's stock price over time in comparison to the overall market, and the risk premium between the risk-free rate (generally, long-term U.S. Treasury bonds) and the market's return (generally, the return of the S&P 500 or another broad indicator for common stocks).[81]

In financial economics, volatility is synonymous with risk. Hence, companies with betas of less than 1.0 are seen as less risky than the overall market, betas above 1.0 are more risky, and betas ~1.0 mimic the riskiness of the market. In Opinion 569, FERC relied on Value Line's estimate of

[81] Briefing Order, 165 FERC ¶ 61,118 at P 36.

beta for the sample utility companies. The MISO CAPs provided the following description of Value Line's methodology:[82]

> *Value Line* measures a "raw" beta based on a regression of the monthly returns of the individual companies, relative to the New York Stock Exchange, over a five-year period. *Value Line* then adjusts the raw beta for the long-term tendency of beta to converge on the market beta of 1 over long periods of time. *Value Line's* adjusted betas represent a raw beta estimate given two-thirds weight and the market beta of 1 given one-third weight. *Value Line* publishes its adjusted betas.[83]

The justification for adjusted betas relies on the observation that "raw" betas, or the betas observed from the statistical relationship revealed by regressing utility stock returns on overall market returns, tend towards the average beta (a.k.a. market beta) of 1.0 over time. Utility companies, true to their reputation as safe investment assets, generally have betas of less than 1.0. As shown in Exhibit II of the Appendix, all of the sample utility companies had, as reported by Value Line, adjusted betas of less than 1.0 with an average adjusted beta of 0.75, meaning that the average unadjusted beta, which measures the actual statistical relationship between the utility and market return series, was 0.625.[84] As such, the application of adjusted betas in the CAPM had the effect of increasing the estimated cost of equity as the raw betas were adjusted upwards. Using adjusted betas instead of the appropriate unadjusted betas increased the CAPM

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[82] Value Line provides the following description of its methodology: "At Value Line, we derive the Beta coefficient from a regression analysis of the relationship between weekly percentage changes in the price of a stock and weekly percentage changes in the NYSE Composite Index over a period of five years. In the case of shorter price histories, a shorter time period is used, but two years is the minimum. Value Line then adjusts these Betas to account for their long-term tendency to converge toward 1.00.". Andrew J. Cueter, "Using Beta", Value Line, October 2, 2012, https://www.valueline.com/Tools/Educational_Articles/Stocks/Using_Beta/

[83] MISO Complaint-Aligned Parties Initial Brief at 32 in Docket No. EL14-12-003.

[84] From Exhibit II of the Appendix, the average Value Line beta for the utility proxy group was 0.75. Undoing the Value Line adjustment results in a beta of 0.625 ((0.75 – 1/3)*3/2 = 0.625).

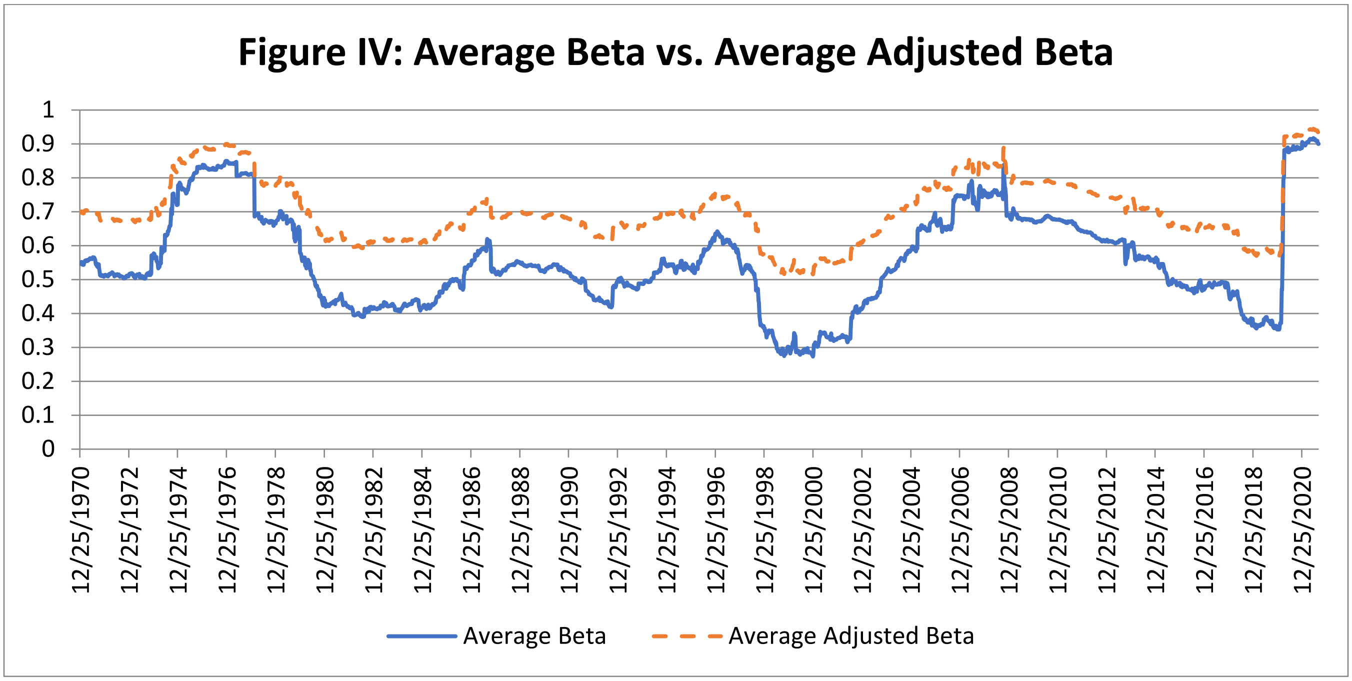
estimate by ~100 basis points.[85] Unfortunately, no party challenged the use of Value Lines's adjusted betas in the dockets pertaining to Opinion 569.

The rationale for adjusted betas stretches back to Blume (1971) where the long-run convergence of beta towards 1.0 was observed and an adjustment to beta was suggested which was the progenitor of the Value Line adjustment. However, Blume's findings were based on all stocks in the New York Stock Exchange, not individual securities. Although the convergence of betas towards 1.0 is perhaps a fair assumption to make *on average* across the entire stock market, it is not necessarily true that this characterizes the beta of a specific security. Of course, in ROE proceedings, the issue is the riskiness of a particular kind of security: utility stock. When determining the fair ROE for a utility using the CAPM, the concern is (or should be) with how *utility* betas vary over time. If utility betas do not have a long-run average of 1.0, then the use of adjusted betas in utility ROE proceedings is unjustified.

Some studies have supported that the long-run average of utility betas is significantly lower than 1.0. Gombola and Kahl (1990) concluded that the assumption of an underlying mean beta of 1.0 was too high for most utilities and indicated that the historical mean was closer to 0.5. Michelfelder and Theodossiou (2013) showed empirically that utility betas do not have a tendency to converge to 1.0 and concluded that the adjusted betas as reported by Value Line are not applicable for public utilities. Although these studies relied on several regression analyses to support their findings, all that is really needed to debunk the applicability of the Value Line adjustment to utility betas is a plot of the historical unadjusted beta vs. adjusted beta. The below

[85] In FERC's midpoint methodology, the average of the highest and lowest estimates from the zone of reasonableness determined the result for the CAPM. Using the CAPM data provided by the Trial Staff (see Exhibit III of the Appendix), the highest estimate was 13.09% from Black Hills Corp. with a 0.95 Value-Line beta, the lowest estimate was 7.8% from Duke Energy Corp. (or equivalently Southern Co.) with a 0.6 Value-Line beta. Unadjusting the betas results in an average estimate of 9.42% while the average is 10.45% with adjusted betas. As such, using Value-Line adjusted betas raised the CAPM result by ~100 basis points.

Figure IV provides a graph of these historical series based on data from Yahoo Finance for the sample utility companies available as of December 2021. The Average Beta represents the mean unadjusted or "raw" utility beta and the Average Adjusted Beta indicates the mean utility beta after applying the Value Line adjustment.[86]



It is undeniable based on Figure IV that the Value Line adjustment is inappropriate. Clearly, utility betas have been consistently below 1.0 and, as shown in Exhibit II of the Appendix, the historical sample suggests an average of 0.55. Although the average adjusted beta for 2015 based on the Yahoo Finance data came to 0.69 while the average Value Line beta was 0.75, this sort of discrepancy resulting from the use of different financial sources cannot justify the use of adjusted betas as the average historical beta is significantly below 1.0 no matter the source of information. Even when considering the Value Line betas of the proxy utility group, not a single estimate was at or above 1.0, an observation which should have caused one of the

[86] See Exhibit II of the Appendix for further detail on the data used for Figure IV.

parties to question the legitimacy of an adjustment whose premise is that betas "converge" to 1.0. In any case, a brief review of the historical data puts the question beyond doubt.

It would be remiss to not mention the abrupt and unprecedented increase in utility betas which occurred in spring 2020, although this information was not a factor in Opinion 569 as FERC's decision only considered data from 2015. Exhibit IV of the Appendix details how this increase should be viewed as a vagary resulting from the financial turbulence during the onset of the COVID-19 pandemic. An equally precipitous decline should occur in spring 2025 once the COVID-19 observations roll out of the beta calculation, meaning that utility betas of ~0.9 should not be considered as representative of the systematic risk of utility stock in forthcoming periods.

3. Size Premium and Other Adjustments

In Opinion 569, the Commission found that the application of a size premium adjustment to the CAPM was warranted, stating, "we conclude that the size premium adjustments improve the accuracy of the CAPM results and cause it to better correspond to the costs of capital estimates employed by investors."[87] FERC cited the following passage from Dr. Morin in support:

> Investment risk increases as company size diminishes, all else remaining constant. Small companies have very different returns than large ones, and on average they have been higher. The greater risk of small stocks does not fully account for their higher returns over many historical periods.[88]

In other words, the rationale for the size premium adjustment is that for firms with smaller market capitalization vis-à-vis larger firms, the traditional CAPM underpredicts the actual stock return, even after considering the higher betas of small firms, so an upwards adjustment is made.

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[87] Opinion No. 569, 169 FERC ¶ 61,129 at P 297 (2019).

[88] *Id.* at P. 299 citing Morin, *New Regulatory Finance*, 181.

For large firms, the CAPM overpredicts the actual stock return so the size term involves a downwards adjustment. In ROE proceedings, the size premium will typically raise the estimate from the CAPM as public utilities, for the most part, conveniently fall into the small market capitalization category; 32 of the 40 sample utilities used in Opinion 569 had small market capitalizations.[89] As such, the application of the size premium adjustment raised the CAPM estimate by 69 basis points.[90]

The complainant parties as well as FERC's trial staff opposed the use of the size premium adjustment in the CAPM. David C. Parcell, on behalf of the Resale Power Group of Iowa, explained the issue:

> [T]he small size adjustment in the Morningstar studies is based on the analysis of the stock of all publicly-traded companies, the majority of which are unregulated and operate in industries that are much riskier than the utility industry. While it may or may not be true that on an overall market basis, smaller publicly-traded firms exhibit more risk than larger firms, it is true that these smaller companies tend to be engaged in riskier businesses as a whole than do large businesses. But that is definitely not the not the case for regulated electric utilities like the MISO TOs.[91]

As it was for Value Line's adjusted betas, the application of size premiums unfairly assumes that a statistical phenomenon observed over the breadth of the entire stock market also applies to regulated utilities. FERC noted, "though not uniform, a sufficient amount of academic literature exists to indicate that many investors rely on the size premia" and proceeded to cite Dr. Morin

[89] Exhibit II of the Appendix indicates the size premium adjustment for the proxy utilities.

[90] In FERC's midpoint methodology, the average of the highest and lowest estimates from the zone of reasonableness determined the result for the CAPM. Using the CAPM data provided by the Trial Staff (see Exhibit III of the Appnedix), the highest estimate was 13.09% from Black Hills Corp. with a 1.74% size premium adjustment, the lowest estimate was 7.8% from Duke Energy Corp. (or equivalently Southern Co.) with a -0.36% size premium adjustment. Without the size premium adjustment, the average is 9.76% while with the adjustment the average is 10.45%, so the effect of the size premium adjustment was to raise the CAPM estimate by 69 basis points.

[91]Affidavit of David C. Parcell on Behalf of the Resale Power Group of Iowa at P. 14 in Docket No. EL14-12-003.

amongst other sources which support that a size adjustment is commonly applied when estimating the cost of equity with the CAPM.[92]

Whatever the merit of using a size premium adjustment alongside the traditional CAPM in a general context, the issue at-hand in ROE proceedings should be the economic rationale for applying the adjustment to a group of regulated utilities. Academic writings on this topic are sparse, although the complainants referenced a study by Wong (1993) which failed to find evidence of a size effect for a sample of 152 electric and gas companies from 1968-1987. FERC countered the Wong study by citing Zepp (2003) who suggested a small firm size effect in the utility sector based on a DCF analysis of four water utilities, two large and two small, from 1987-1997. The DCF study revealed a higher cost of equity for the small firms. It's rather ironic that the Commission referenced this study given that it expressly rejected the same type of analysis from its trial staff which, using the financial data from the dividend-paying S&P 500 companies, "shows there is no meaningful relationship between forward-looking DCF results and current market capitalizations."[93] FERC nonetheless found the DCF analysis to be "unconvincing" in this case, stating, "a regression analyses [sic] on the reasonableness of CAPM model inputs using the DCF model is unpersuasive, since that model does not consider betas at all."[94] Apparently, per the Commission, using a DCF analysis to examine the significance of the size effect is only acceptable when in support of its inclusion.

[92] For example, see Roger A. Grabowski, "The Size Effect Continues to be Relevant When Estimating the Cost of Capital", *Business Valuation Review*, Fall 2018, at 93–109 & Roger G. Ibbotson and James P. Harrington, "Using a Non-Beta-Adjusted Size Premium in the Context of the CAPM Will Likely Overstate Risk and Understate Value", Quick Read, Jan. 30, 2019, https://quickreadbuzz.com/2019/01/30/business-valuationgrabowski-harringtonsing-a-nonbeta-adjusted-size-premium.

[93] Initial Brief of the Commission Trial Staff at 16 in Docket No. 14-12-003.

[94] Opinion No. 569, 169 FERC ¶ 61,129 at P 302 (2019).

Furthermore, the application of the size premium adjustment is motivated by empirical findings which suggest that it improves the CAPM's predictive accuracy. However, its rationale essentially does not extend beyond empirical considerations into stating anything fundamental about the risk of the company to which it is applied, whether large or small. Various authorities have supported that the adjustment is empirical in nature. For example, Brealey, Myers, and Allen in *Principles of Corporate Finance* noted that although the firm size effect can be seen when looking at historical returns, this could have been the result of a chance strategy which worked in the past, otherwise known as "data mining".[95] Damodaran (2021) acknowledged the presence of a size effect when examining historical returns but provided the following criticism:

> Even if you believe that small cap companies are more exposed to market risk than large cap ones, this is a sloppy and lazy way of dealing with that risk, since risk ultimately has to come from something fundamental (and size is not a fundamental factor). Thus, if you believe that small cap stocks are more prone to failure or distress, it behooves you to measure that risk directly and incorporate it into the cost of equity.[96]

Although Damodaran's assessment pertained to the general use of the size premium, it makes apparent the crucial problem with its application to public utilities. Ultimately, FERC did not provide specific evidence as to why the 32 utility companies with small market capitalizations entailed higher risk than that already captured by beta. In all plausibility, the Commission possessed no such evidence; the basis of its rationale rested on a *general* finding on the performance of small vs. large companies across the entire stock market when examining *past* returns. This is not to say that there could never be idiosyncratic factors which merit the

[95] Richard Brealey, Stewart Myers, and Franklin Allen, *Principles of Corporate Finance* (New York, NY: McGraw-Hill, 2020), 212.

[96] Aswath Damodaran, "Equity Risk Premiums (ERP): Determinants, Estimation, and Implications – The 2021 Edition" (March 23, 2021). Available at SSRN: https://ssrn.com/abstract=3825823, at 52.

adjustment of the cost of equity obtained from the proxy group of utilities, although no such adjustment was required for the MISO TOs as the Commission found them to be "of average risk".[97] However, it should be incumbent upon regulators to identify those specific business risks and explicitly account for them by directly reducing or increasing the ROE found from the proxy group estimation. The application of the size premium in the context of public utilities should not be viewed credibly as it makes a naïve assumption about the increased risk of "small" utilities.

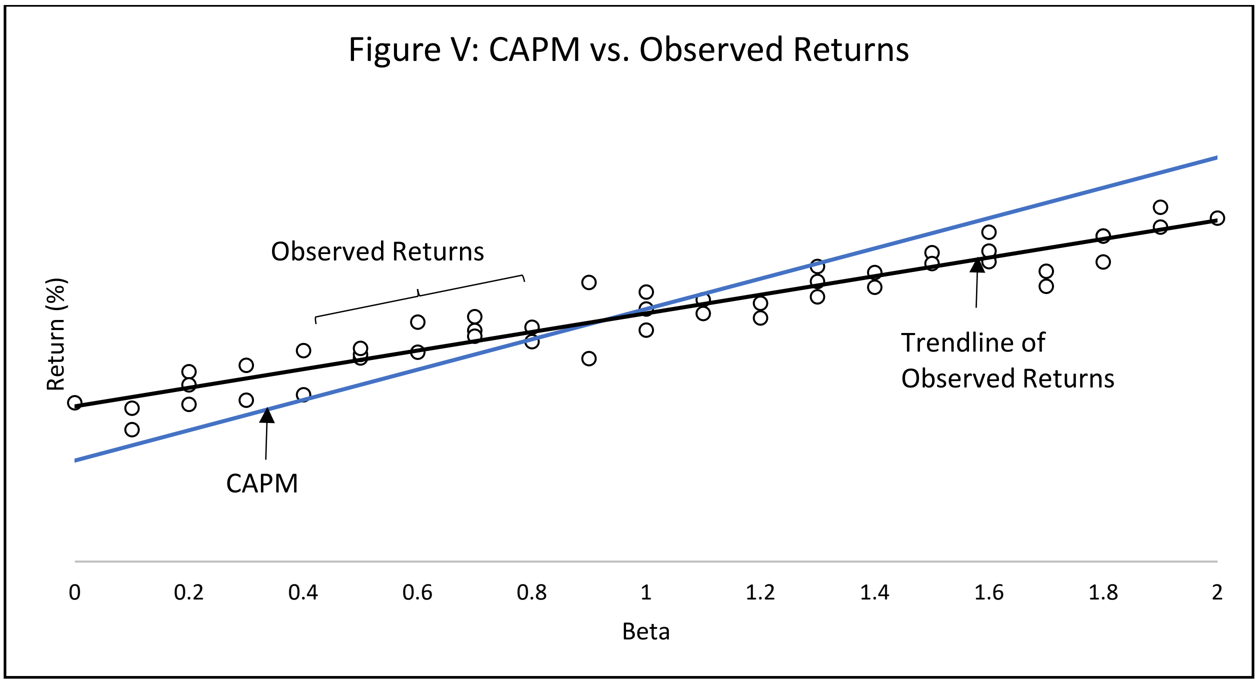
Despite lacking an economic justification for the size effect, the Commission argued that its inclusion improves the accuracy of the CAPM. This, however, can be viewed as just another finding grounded in self-fulfilling logic. Naturally, any adjustment to the CAPM which increases the estimate for a utility is likely to improve the *historical* performance of the model as it has been the tendency for regulators to award excessive returns. When comparing FERC's CAPM methodology to the approaches recommended herein, FERC's estimate would compare favorably to the historical data as utilities' past returns reflect the rates approved by regulators. To the extent that utility commissions had historically adopted more just and reasonable ROEs based on the actual risks faced by public utilities, then estimates which suggest lower ROEs would appear closer to actual returns.

To put it concretely, according to Exhibit II of the Appendix, the average yearly return for the sample utilities was 11.35%. Whether it was FERC's market risk premium methodology which resulted in an inordinately high estimate of 9.12% for 2015, or the use of adjusted betas which always unduly increase the observed systematic risk of utilities, or the tacking on of a size premium, each of these procedures would return an estimate which more closely resembles the 11.35% than a standard CAPM methodology with a more reasonable estimate of the equity risk

[97] Opinion No. 569, 169 FERC ¶ 61,129 at P 411 (2019).

premium, unadjusted betas, and no size premium which produces a lower result. In summary, the observation that FERC's approach to the CAPM improves its historical accuracy is completely irrelevant given regulators' fundamental influence on the observed level of historical returns.

It's worth mentioning that the size premium is but one of numerous adjustments suggested in the financial literature to correct for the empirical shortcomings of the traditional CAPM, although FERC did not adjudicate other such modifications in Opinion 569. The motivation for these adjustments is to flatten the slope of predicted returns from the traditional CAPM in order to more closely approximate the trend of observed returns. Figure V illustrates the issue using example data.



One such adjustment is the Empirical CAPM or ECAPM. Dr. Avera, in his testimony on behalf of the MISO TOs, referenced the ECAPM recommended by Dr. Morin to determine the cost of equity:

> As discussed in *New Regulatory Finance*, empirical evidence suggests that the expected return on a security is related to its risk by the ECAPM, which is represented by the following formula:

$$Rj = Rf + 0.25(Rm - Rf) + 0.75[\beta j(Rm - Rf)]$$

> This ECAPM equation, and the associated weighting factors, recognizes the observed relationship between standard CAPM estimates and the cost of capital documented in the financial research, and corrects for the understated returns that would otherwise be produced for low beta stocks.[98]

As it appears above, the ECAPM is mathematically indistinguishable from the application of adjusted beta except that ¼ weight is given to the market beta of 1.0 and ¾ weight is assigned to the raw beta. In keeping with Dr. Morin's recommendation, Dr. Avera even continued to apply Value Line's adjusted betas in the ECAPM, effectively assigning half the weight to the market beta and half to the raw beta.[99] [100] As such, in the context of ROE proceedings, the ECAPM is sometimes used as a veiled measure to further increase the supposed riskiness of utilities and thereby justify a higher cost of equity.

Another oft-cited model is the Fama-French Three-Factor Model which is the traditional CAPM plus a size effect and a term to capture the difference in returns for high-minus-low book-to-market stocks. As noted by Fama and French (2004):

> From a theoretical perspective, the main shortcoming of the three-factor model is its empirical motivation. The small-minus-big (SMB) and high-minus-low (HML) explanatory returns are not motivated by predictions about state variables of concern to investors. Instead they are brute force constructs meant to capture the

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[98] Answering Testimony of William E. Avera, PHD, CFA on Behalf of The MISO Transmission Owners in Docket No. EL14-12-002 at 114.

[99] For Dr. Morin's recommendation that adjusted betas should be used in the context of the ECAPM, see *New Regulatory Finance* at 191. For Dr. Avera's application of the ECAPM, see Answering Testimony of William E. Avera, PHD, CFA on Behalf of The MISO Transmission Owners in Docket No. EL14-12-002 at Exhibit No. MTO-11.

[100] Where $Beta_{Market} = 1.0$:

- $Beta_{Adjusted} = 2/3(Beta_{Raw}) + 1/3(Beta_{Market})$
- ECAPM Betas where B_j is $Beta_{Raw} = 1/4(Beta_{Market}) + 3/4(Beta_{Raw})$
- ECAPM Betas where B_j is $Beta_{Adjusted} = 1/4(Beta_{Market}) + 3/4(2/3(Beta_{Raw}) + 1/3(Beta_{Market}))$
  $= 1/2(Beta_{Market}) + 1/2(Beta_{Raw})$

> patterns uncovered by previous work on how average stock returns vary with size and the book-to-market equity ratio.[101]

Once more, it can be seen how extensions of the CAPM aren't associated with an underlying economic justification for why, assuming all else equal, small market-cap companies or firms with high book-to-market ratios should be determined to have a higher cost of equity; it just so happens that including these terms alongside the traditional CAPM improves the performance of the model. Again, the merit of such procedures in improving the accuracy of the traditional CAPM should be a moot point in ROE proceedings given the inseparable connection between regulators' rulings and the observed returns from public utility stocks upon which the accuracy of the model is assessed. For an argument to prove availing in determining the awarded ROE, its economic logic should be transparent, understandable, and not dependent on data mining or otherwise circular reasoning. Unfortunately, this standard would disqualify most all of the tools regulators currently use to determine a utility's cost of equity.

F. State ROEs

Although FERC in Opinion 569 decided against consideration of ROEs authorized by state utility commissions in determining the ROE awarded to the MISO TOs, the Commission did not rule-out that such information could inform future ROE proceedings.[102] In response, the MISO TOs argued that the Commission's finding of a 9.88% ROE was arbitrary and capricious given that the midpoint of state ROEs for integrated utilities, which FERC found to be of lower risk than transmission companies, was 10.225% for the two years ending March 31, 2015.[103] In

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[101] Eugene F. Fama and Kenneth R. French, "The Capital Asset Pricing Model: Theory and Evidence" *Journal of Economic Perspectives*, Volume 18, Number 3 (Summer 2004): 39.

[102] Opinion No. 569, 169 FERC ¶ 61,129 at P 363-364 (2019).

[103] Request for Rehearing of the MISO Transmission Owners in Docket No. EL14-12-004 and Docket No. EL15-45-001 at 16.

Opinion 569-A, the Commission reaffirmed its initial decision to not consider state ROEs, noting that the issue was partially ameliorated by the award of a higher 10.02% ROE and that it is not legally required to base transmission ROEs on state jurisdictional ROEs.[104]

Nonetheless, were regulators to dispose of the distorted methodologies typically used to determine utilities' cost of equity, it is likely that existing state-authorized ROEs would be used in a similar manner as by the MISO TOs to inveigh against any reductions. Such arguments would have it backwards, however. It is the methods currently practiced by regulators at both the federal and state/local level to determine awarded ROEs which are arbitrary and capricious, not the results which expose the fallacies behind their approaches. Given that regulators throughout the entirety of the U.S. establish their ROEs based on some combination of the erroneous framework adopted by FERC in Opinion 569, pointing to state ROEs as evidential of the just and reasonable ROE is just another example of self-perpetuating logic and should be dismissed.

G. Conclusions on the Just and Reasonable ROE

From the foregoing examination of FERC's methodology, there is not much which could be considered fair in the Commission's approach to ascertaining the truly just and reasonable ROE. The Expected Earnings model, Risk Premium methodology, and DCF model are all inherently circular and should have been rejected. The remaining model is the CAPM, but the Commission's misspecification of the model led to an excessively high estimate. A valid approach to the CAPM would have been to adopt values commonly used by the investment community for the risk-free rate and market risk premium, apply unadjusted betas to the market risk premium, and discard the baseless size premium adjustment. Using the average risk-free rate and market risk premium found in Fernandez, Ortiz Pizarro, and Fernandez Acin (2015) of 2.4%

[104] Opinion No. 569-A, 171 FERC ¶ 61,154 at P 167 (2020).

and 5.5%, respectively, taking the average beta of 0.625 from the sample utilities after undoing the Value Line adjustment, and applying these parameters to equation (6) results in an estimate of 5.84%.

Utility representatives and regulators accustomed to significantly higher rates would probably scoff at the notion that this could be the just and reasonable ROE. The parties involved in Opinion 569 would likely point to FERC's low-end outlier test applied to the CAPM which excluded estimates below 6.47% as evidence to dismiss 5.84% as the fair ROE, although this threshold was notably based on Moody's average Baa Utility Bond Yield plus 20% of FERC's extreme 9.12% market risk premium; a prior iteration of the threshold merely added 100 basis points to the average Baa Utility Bond Yield, resulting in a 5.65% threshold.[105] In any case, a convergence of utility ROEs towards utility bond yields should not be viewed as untoward. Utility stocks are characteristically similar to bonds in that they provide a stable stream of income from a safe investment source, so a ~100 basis point premium to compensate for equity's incremental risk is a justifiable finding. Ultimately, the 5.84% fair ROE for public utilities comes from a proper implementation of the CAPM, which FERC acknowledged as the most common model for estimating the cost of equity.[106] [107] As such, it really should be that this standard

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[105] Opinion No. 569, 169 FERC ¶ 61,129 at P 388 (2019).

[106] *Id.* at P 236. FERC cited "the CAPM is by far the most popular method of estimating the cost of equity capital." from John R. Graham and Campbell R. Harvey, *The theory and practice of corporate finance: Evidence from the field*, 60(2) Journal of Financial Economics 187, 201 (2001) and Michael C. Ehrhardt and Eugene F. Brigham, *Financial Management: Theory and Practice* 253 (13th ed. 2011) ("[T]he basic CAPM is still the most widely used method for thinking about required rates of return on stocks.").

[107] Notably, Professor Aswath Damodaran, using data as of January 2021 and an approach based on the standard CAPM, indicated that the cost of equity for general utilities was 4.42%. This estimate was driven by a relatively low risk-free rate of 0.93% and a market risk premium of 4.72%, although the beta for the industry was 0.74. See https://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/wacc.html.

application represents the starting point in determining a utility's cost of equity, with any adjustments requiring a rigorous explanation.

No matter the provision of objective information that demonstrates the fallacies which inform prevailing ROEs and the degree of their excessiveness, there is likely to be inertia on the part of regulators to award an ROE based on an intellectually justified analysis. Part of the issue would probably be a desire to maintain predictability in utility ratemaking and to approach changes gradually. A compromise approach could be to award the expected market return as suggested by the CAPM instead of the true required return. In the context of Opinion 569, this would have meant authorizing a 7.9% ROE vs. the actual award of 10.02%.[108] For the time being, a cut of ~200 basis points from the current level should strike a balance between maintaining gradualism in utility rate changes while still allowing for authorized ROEs to better reflect objective information. Nonetheless, there should be an acknowledged principle that awarded ROEs will continually approach the true just and reasonable ROE over time.

A final point on the just and reasonable ROE: some might assert that the awarded ROE should be set above the utility's cost of equity because the return realized through its levied rate charges may differ from the authorized ROE. This is a non-issue for the MISO TOs as their formula rate structure contains true-up provisions which ensure the recovery of the authorized ROE.[109] In jurisdictions without formula rates which guarantee the level of the earned ROE, it may be fair for regulators to consider the risk that a utility may not earn its cost of equity and assess this in the awarded ROE. However, given that utilities are currently authorized ROEs well

[108] Fernandez, Ortiz Pizarro, and Fernandez Acin (2015) indicated a 2.4% risk-free rate and a 5.5% market risk premium for the U.S., resulting in a 7.9% expected market return.

[109] Rebuttal Testimony and Exhibits of J. Bertram Solomon on behalf of the Joint Customer Intervenors in Docket No. EL14-12-000 at 12.

above their cost of equity, the difference between earned ROEs and authorized ROEs is a moot observation until authorized ROEs approach the actual cost of equity.

III. Related Issues

A. Capital Structure

In addition to the cost of equity, the composition of the utility's assets funded by debt and equity, or the capital structure, must be considered to determine a utility's overall required return. Although the MISO TOs' capital structure was not in the purview of the Opinion 569 proceedings, state commissions often rule on the authorized capital structure in conjunction with setting the ROE to establish the overall rate of return. The common formula for setting the overall rate of return, otherwise known as the Weighted Average Cost of Capital ("WACC"), is as follows:[110]

$$(8)\ \mathrm{WACC} = r_D * \frac{D}{V} + r_E * \frac{E}{V}$$

where: r_D = cost of debt
r_E = cost of equity
D = value of debt
E = value of equity
V = D + E

In setting utility rates, the WACC is applied to the book value of the rate base, so D, E, and V in equation (8) represent book values. The cost of debt, r_D, is represented by the market rate of interest in the traditional WACC formula, but for purposes of utility ratemaking it is typically the embedded cost of debt which is the utility's actual interest cost based on its outstanding bond

[110] Preferred stock is ignored for simplicity.

issues.[111] Interest on corporate debt is tax deductible, so r_D is usually arrived at by applying a (1 – T) factor to the embedded cost of debt, where T is the corporate tax rate.

There are factors which favor the use of debt in a utility's capital structure. Clearly, the tax deductibility of interest expense lowers the revenue requirement in a way which equity does not. Utilities' cost of debt is also currently much lower than awarded ROEs; Moody's average Baa Utility Bond Yield was 4.65% for the MISO I period from January-June 2015 and was 5.41% for the MISO II period from July-December 2015.[112] [113] The conventional wisdom, however, is that the effect of rebalancing the capital structure to include more debt, or "leveraging", is to magnify the firm's profit or loss. Leveraging increases the volatility of returns to shareholders which implies an increased cost of equity and in turn reduces the benefit from debt in lowering the overall cost of capital.

It's commonplace for commissions to authorize overall rates of return using a ~50% debt, ~50% equity capital structure; the MISO TOs' average capital structure was 52.4% equity per Attachment O of the MISO Tariff as of January 2015.[114] Given the advantages of debt, it seems reasonable that commissions would authorize capital structures weighted towards debt in order to minimize the overall cost of capital. Critics, however, would likely reference the framework set forth by Modigliani and Miller (1958) who found that the value of the firm is

[111] The use of embedded interest cost prevents windfall profits/losses to shareholders. If the market rate of interest exceeds the embedded interest cost, the utility would over-collect on its debt expense and the surplus would accrue to shareholders. If the market rate of interest is less than embedded cost, the utility would under-collect on its debt expense and shareholders would incur a loss as debtholders have a primary claim on the firm's earnings.

[112] Opinion No. 569, 169 FERC ¶ 61,129 at P 380 (2019).

[113] As of 1/13/2021, Moody's Season Baa Corporate Yield was 3.5%. See "Moody's Season Baa Corporate Yield", FRED Economic Data, https://fred.stlouisfed.org/series/DBAA.

[114] Brief of the Joint Complainants in Docket No. EL14-12-002 at Exhibit JC-3, citing Attachment O of the MISO Tariff filed January 2015.

independent of the capital structure selected by its management. A proposition from their work was that the cost of equity relates proportionally to the debt-to-equity (D/E) ratio as described by the following equation:[115]

$$(9)\ r_e = \rho + (1 - \tau)(\rho - i)\frac{D}{E}$$

where: r_e = cost of equity
ρ = unlevered cost of equity
τ = corporate tax rate
i = current market rate of interest on debt
D/E = debt-to-equity ratio

Note that the cost of equity, r_e, equals the unlevered cost of equity, ρ, when D/E = 0 or when the firm has no debt and is entirely financed by equity. In accepting this framework, the impact of changes to the D/E ratio on the utility's cost of equity can be assessed. Using equation (9), Exhibit V of the Appendix indicates the effect of increased debt levels on the MISO TOs' cost of equity as well as on their overall cost of capital. The *i* term is 4.65% per Moody's Baa Utility Bond Yield during the MISO I period. To illustrate how differing corporate tax rates affect the advantage from debt financing, examples where τ = 0%, 21%, and 35% are provided.[116] The unlevered cost of equity, ρ, can be imputed using these parameters and when given the cost of equity, r_e, at the current debt level. Of course, the cost of equity was the central controversy of the Opinion 569 proceedings, so three estimates are shown: the first row is the cost of equity at increasing leverage ratios as represented by the true just and reasonable cost of equity where r_e is 6% when the D/E ratio = 1, the third row represents the cost of equity as

[115] This equation results from their updated 1963 analysis which reflects the tax advantage of debt financing; Franco Modigliani and Merton H. Miller, "Corporate Income Taxes and the Cost of Capital: A Correction" *The American Economic Review*, Vol. 53, No. 3 (June 1963): 439.

[116] τ = 0% reflects the scenario where there is no tax advantage to debt financing, τ = 21% reflects the corporate tax rate as of 2021, and τ = 35% reflects the corporate tax rate in 2015.

determined by FERC in Opinion 569 where r_e is 10% when the D/E ratio = 1, and the second row represents the midpoint where r_e is 8% when the D/E ratio = 1. The below Table II shows the example where τ = 21%.

Table II: Cost of Equity vs Debt % of Capital Structure where τ = 21%

D/E Ratio	1	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00
Debt %	50%	56%	60%	64%	67%	69%	71%	73%	75%
Unlevered Cost of Equity									
5.40%	6.00%	6.15%	6.30%	6.45%	6.60%	6.74%	6.89%	7.04%	7.19%
6.52%	8.00%	8.37%	8.74%	9.11%	9.48%	9.85%	10.22%	10.59%	10.69%
7.64%	10.00%	10.59%	11.18%	11.77%	12.36%	12.95%	13.54%	14.13%	14.72%
Total Cost of Capital									
	4.84%	4.77%	4.72%	4.68%	4.65%	4.62%	4.59%	4.57%	4.55%
	5.84%	5.76%	5.70%	5.65%	5.61%	5.57%	5.54%	5.52%	5.49%
	6.84%	6.75%	6.68%	6.62%	6.57%	6.53%	6.49%	6.46%	6.44%

As shown, the rate at which the cost of equity rises with the D/E ratio depends on the assumed cost of equity. For the 6% estimate, every 0.25 increase in the D/E ratio increases the cost of equity by 15 basis points while for the 10% estimate the cost of equity rises by 59 basis points. Notably, the total cost of capital declines as more debt is added due to the tax deductibility of interest expense. Some might argue that the risk of financial distress would eventually offset the tax advantage of debt at higher D/E ratios and raise the overall cost of capital, but this seems implausible in the case of public utilities over the range shown above, especially when considering a modest increase in the D/E ratio to 1.25 or 1.5.[117] Thus, even if one strictly adheres to the Modigliani-Miller ("MM") model, there's reason to uphold that utilities' overall cost of capital would be lowered by increased debt levels.

[117] Some might further argue that the market interest expense increases with the D/E ratio even if the D/E is below the level where financial distress risk is a factor. This is perhaps valid, but the *i* term in equation (9) would also increase and the cost of equity would increase at a lower rate. Thus, the effect of increased debt levels on the overall cost of capital is much the same as shown in Table II.

The results from the MM approach, however, should be viewed with a pound of salt. For one, while the MM framework asserts that the value of the firm is independent of its underlying capital structure (at least when ignoring the tax advantage of debt), it's doubtful this much applies to public utilities where the firm's operating income is a direct function of its authorized capital structure. As equity has a higher cost than debt, an obvious way for the utility to accumulate more earnings is to weigh the capital structure towards equity as the regulator allows the utility to pass through its approved costs to ratepayers. Moreover, the relationship between the D/E ratio and the cost of equity as shown in equation (9) stretches credulity when applied to public utilities as regulation functions to reduce the volatility of expected returns to shareholders. The proposition in that equation as applied to the MISO TOs is made transparently frivolous by their governing tariff whereby the authorized level of profit is guaranteed; the outcomes predicted by MM are simply irrelevant when regulation explicitly collapses the variability of expected returns to zero.

Critics of the declining overall capital cost shown in Table II might appeal to Miller (1977)[118] where the effect of personal taxes was shown to offset the benefit of interest deductibility at the corporate level given that dividends and capital gains are taxed at a lower rate than interest income. This personal tax difference is perhaps a compelling explanation, or at least one reason, for why corporations generally don't avail themselves of debt financing to the extent predicted by the MM model with corporate income taxes. To repeat a theme, whatever the merit of this rationale for the general firm, it's inapplicable to utility regulation. Utility investors may indeed favor the payout of operating income through equity for personal tax reasons. It follows that, even if the total cost of capital at the corporate level is lowered by debt in the manner shown

[118] The same Merton H. Miller of Modigliani-Miller.

in Table II, investors will inveigh on behalf of an authorized capital structure tilted towards equity because this ultimately maximizes their personal income. However, as substantiated by FERC in Opinion 569, the goal of regulation is not to maximize the value of the firm for investors, it's to approve prices which are just and reasonable. What matters is the cost of capital at the corporate level because this indicates the cost *to ratepayers* of financing the utility's rate base; how things shake out for investors after personal taxes should be moot from a regulatory perspective. Furthermore, the effect of personal taxes should not be viewed as implicating the estimated cost of debt or equity used in the WACC formula considering that personal tax effects are already impounded into observed yields from capital markets.[119]

In all practicality, financial theory gives limited insight into determining the just and reasonable capital structure for a public utility. It's the role of regulators to understand the utility's relevant financial information, appropriately assess its business risk, and make a ruling on whether more debt can be accommodated or if leverage should be reduced from existing levels. The data from the MISO TOs once again provides insight into the efficacy of the current regulatory paradigm. In this vein, it's worthwhile to hypothesize on the effect of, and assuming all else equal, an increase in the MISO TOs' authorized D/E ratio from 1 to 1.25.[120] According to Table II, when generously assuming FERC's 10% allowed ROE represents the true cost of equity when D/E = 1, the discount rate for the MISO TOs would increase from 10% to 10.59%. Presuming that the authorized ROE of 10% remains intact, the share price of the MISO TOs will fall to account for the increased risk and no offsetting expectation of increased income.

[119] The yield on municipal bonds is a notable example of how the effect of personal taxes is incorporated in observed rates of return. The interest income on municipal bonds is generally exempt from federal taxes, so a lower yield is required from these securities, at least from investors who face taxes on interest income. This sort of effect can be thought of as implicit in any observed yield.

[120] It is the purview of the MISO TOs' state jurisdictional commissions to rule on their authorized capital structure.

But so what? Assuming the MISO TOs have similar M/B ratios as shown in Figure I, the fall in share price won't be enough to drive market value below book value and threaten the MISO TOs' ability to fund transmission assets. In the meantime, ratepayers would enjoy a lower cost of capital as less expensive debt is substituted for equity and there is no attendant increase in the ROE collected through rates. Even if FERC reacts to increase the allowed ROE to 10.59% to account for the higher leverage, the cost of capital would still be lower than before because of the tax advantage of debt. The foregoing analysis remains under the auspices of MM which, as it is applied in the context of regulated utilities, makes dubious assumptions about the way investors react to increased leverage. In all likelihood, such moderate increases in the level of debt won't have much bearing on how investors price the stock of the MISO TOs, almost certainly not to the extent indicated in Table II considering the MISO tariff guarantees that the authorized ROE is recovered, and ratepayers would reap an arbitrage gain from higher leverage. To summarize, all signs indicate that regulators have been too deferential to investor interests when considering authorized capital structures. The issue is even more salient under the current regime where allowed costs of utility equity are more than twice as high as debt.[121] Given the stability afforded to public utilities by virtue of their monopoly status, the tax advantage and relative cheapness of debt, and that currently allowed ROEs far exceed the true cost of equity, it would be prudent for regulators to gradually authorize higher debt ratios.

However, advocates of investor interests have an escape hatch available in the form of ratings agencies, such as Moody's Investors Service and S&P Global Ratings, which opine on the financial integrity of utility companies. A complete review of those firms' methodologies for

[121] Assuming the utility's market interest cost is 4.65% and the utility ROE is 10%, equity is 2.72x as expensive as debt at the margin: 10/(4.65*(1-.21)) = 2.72.

rating utility debt is a subject for further research, but there is reason to doubt fair treatment would be conferred to utilities awarded, per a more justified assessment of capital costs, a lower ROE or authorized a capital structure with higher debt. For example, in the summer of 2018, Moody's changed its utility sector outlook from "stable" to "negative", citing the impact of the recent change in the corporate tax rate on the lowering of cash-flow to interest coverage ratios.[122] Apparently, at least in the eyes of that ratings firm, reduced revenue is viewed unfavorably even when it results from the government explicitly lowering the expenses a utility is required to collect from its customers.

It's thus no stretch to imagine that reductions to the ROE will be viewed in a similarly contemptuous manner. Even if unfair, the ability of ratings firms to influence the cost of debt is an outcome to be reckoned with in ROE proceedings. Ratings agencies are private corporations outside the purview of utility regulators, so it may be that a degree of acquiescence to their unfounded standards must be conceded when ultimately deciding on the authorized ROE and/or capital structure. Nonetheless, the recognition of a legitimate constraint in moving towards the truly just and reasonable ROE would at least ground the ROE proceedings in a meaningful discussion in contrast to, and hopefully in replacement of, endless debate on irrelevant financial methodology.

B. ROE Incentives

In addition to the determination of the base ROE for the MISO TOs in Opinion 569, FERC capped transmission incentive adders to the base ROE at 12.62% per the average of the

[122] Peter Maloney, "Moody's goes negative on regulated utilities for first time, citing tax law impacts," Utility Dive, June 19, 2018, https://www.utilitydive.com/news/moodys-goes-negative-on-regulated-utilities-for-first-time-citing-tax-law/525971/.

upper end of the zone reasonableness indicated by the Risk Premium methodology, DCF model, and CAPM.[123] Such rewards are ostensibly required to incentivize socially desired investments which enhance reliability and/or reduce congestion on transmission lines. Presuming this rationale continues to be upheld, incentives should be made to reflect the true just and reasonable ROE, which indeed means that the incentive cap should likewise be significantly lowered from current levels.

Years of stagnant real investment in transmission infrastructure along with the 2003 Northeast blackout motivated the issuance of FERC Order 679 in July 2006 which was intended to promote transmission investment through incentive-based rates. The order stipulated that the incentive rates were subject to the same requirements which condition the base ROE to be just and reasonable.[124] For the MISO TOs, this meant that the base ROE, established at 12.38% in 2002, plus incentives was capped at 15.69% until Opinion 551 came into effect as of September 28, 2016, with a refund period from November 13, 2013 through February 11, 2015.[125] As indicated herein, FERC's methodology resulted in excessive base ROEs. As such, certain commenters to Order 679 were correct in suggesting that incentive rates were unnecessary as the existing base ROEs were adequate to induce transmission investment. In other words, the award of incentive adders can be seen as a giveaway on top of a giveaway as the base ROE already exceeds transmission utilities' cost of equity.

There are explanations besides ROE incentives for the transmission build-out which occurred starting in the early 2000s. For example, efforts which undoubtedly led to transmission

[123] Opinion No. 569-A, 171 FERC ¶ 61,154 at P 268 (2020).

[124] Order No. 679, 116 FERC ¶ 61,057 (2006) at P 8.

[125] Opinion No. 551, 156 FERC ¶ 61,234 at page 125 (2016).

upgrades were enhanced NERC reliability standards and FERC Orders 890 and 1000 which culminated in regional planning processes to identify and relieve transmission constraints through transmission expansion planning as well as mechanisms to ensure the allocation of costs to all beneficiaries of system upgrades. The need for ROE adders to incentivize transmission build-out should be viewed doubtfully in the context of when the entire region, including the system operator (e.g. MISO, PJM), collaborates to identify the projects which most effectively improve reliability and/or reduce congestion, and moreover when regional cost-sharing spreads the risk from complex projects which span multiple jurisdictions.

In summary, when considering that the utility cost of equity is far lower than the base ROE which is typically awarded, the justification for transmission ROE incentive adders stemmed from the mistaken belief that the base ROE was insufficient to attract transmission investment. Some, however, argue that an ROE above a utility's cost of equity is necessary to stimulate investment. For example, Kihm et al. (2015) provided the following perspective:

> To be clear, we are not suggesting in principle it is inappropriate for a utility to be allowed to earn an equity return in excess of the cost of equity—to the contrary, the return on equity *should* exceed the cost of equity, just as it does for the typical non regulated company. In fact, that is the only way that firms can create value for their investors. Our recommendation is that utility regulators connect this engine of shareholder-value creation more closely to customer- and societal-value creation. A utility earning a rate of return in the ten percent range is earning noticeably more than its cost of equity on every investment. The implications here are important. This system of compensation is predicated on the assumption that nearly all, if not all, **utilities are creating investor value every time they make capital investments**. That may have been appropriate when the primary social goal of the utility sector was to grow enough to provide universal service, and economies of scale were clear.[126]

[126] Steve Kihm, Ron Lehr, Sonia Aggarwal, and Edward Burgess, "You Get What You Pay For: Moving Toward Value in Utility Compensation" June 2015 at 4-5. Available at https://docs.cpuc.ca.gov/PublishedDocs/Efile. Emphasis appears as in the source.

Whether utility investment is predicated upon the award of an ROE *above* the cost of equity is a separate debate from the ruling in Order 569 as the Commission contended that the estimated cost of equity upon which the ROE was based is sufficient to attract capital.[127] Arguing that the 10.02% ROE is needed because it's *higher* than the cost of equity would be shifting the goalposts. Moreover, an aspect which merits higher regard in the discussion on incentives is the fact that a public utility has a statutory obligation to serve customers who pay its rates. An "engine of shareholder value creation" already exists from this arrangement in that utility shareholders are entitled to regulated profits in exchange for having a monopoly over the provision of an essential public good. It is indeed unfortunate that this government-approved relationship, which produces a safe investment for capital, seems to have no practical bearing on the level of profit awarded by regulators. Not only do utilities receive base ROEs that make their profits commensurate with average-risk firms, an observation at-odds with economic logic as utilities enjoy regulatory backing unexperienced in most industries, commissions feel the need to doubly reward them by tacking on additional ROE incentives.

Some would perhaps suggest that while an ROE set at the cost of equity is a fair approach to maintain baseline service, goals such as those envisioned in regional transmission expansion involve specialized innovation which could not be achieved but for the award of economic profit. Such claims should be level-set with the reality that base ROEs already far-exceed the cost of equity for utilities. In this sense, ROE adders merely exacerbate the outcome described by Averch and Johnson (1962) whereby regulated firms allocate resources inefficiently towards capital investment when the allowed rate of return exceeds the cost of capital. This "gold-plating" effect at least reduces the degree of supposed efficiency gains from ROE incentives as

[127] Opinion No. 569, 169 FERC ¶ 61,129 at P 31 (2019).

utilities are further encouraged to pursue capital intensive projects when alternatives, such as energy efficiency programs or demand response, would provide a more optimal societal solution. In conclusion, before deciding that ROE adders are needed to spur investment, more consideration needs to be accorded to utilities' special relationship with the public and that the attendant regulatory environment diminishes the need for incentives which are applicable to relatively competitive firms. In any case, whether or not ROE incentives are perceived as availing in the achievement of specific policy goals, it's necessary that regulators be able to fairly assess the level of the just and reasonable base ROE to obtain the desired outcomes without giving unduly preferential treatment to utility shareholders. Unfortunately, regulators have fallen short in this fundamental task.

IV. Conclusion

As demonstrated in this paper, what is portrayed as technical financial analysis in utility ROE proceedings most often serves to employ self-fulfilling methodology so that preconceived notions are upheld, with perhaps a few tweaks to somewhat incorporate prevailing interest rates into the final result and thus sustain credibility. Circular logic renders the traditional models besides the CAPM moot for determining the utility cost of equity. It follows that approaching the fair ROE involves an application of the CAPM where an expected overall market return is developed, using expectations realistically adopted by the broad investment community, and then appropriately discounted to reflect the low-risk nature of the public utility business. Adopting this more reasoned approach will not be straightforward. Generations of utility regulators and financial analysts have become inculcated in the idea, at least implicitly, that utilities are fairly compensated with an ROE similar to that expected from the average firm. Because of this, there will be inertia in moving towards the truly just and reasonable ROE. Even if an honest technical application which revealed a significantly lower cost of equity were to become accepted, factors extraneous to financial models would likely take on a more prominent role in militating against decreases to the ROE. As Commissioner Richard Glick, who is Chairman of FERC at the time of this writing, noted in his statement concurring in part and dissenting in part to Opinion 569-A:

> To be fair, I am sympathetic to the impulse to consider subjective factors. The Commission's approach to setting a just and reasonable ROE will often implicate broader policy considerations, equity, and other factors that cannot be captured in, for example, a discussion of dividend yields or the appropriate sources of growth rate calculations. But while ROE policy will always be as much art as science, that is no excuse to pretend that art is science.
>
> If broader considerations, including policy goals, are preventing the Commission from settling on or consistently applying an ROE methodology, then we must acknowledge those goals and give the interested entities the chance to weigh in on them just as they do for the intricacies of dividend yields, growth rates, and the like.[128]

Commissioner Glick's statement offers guidance to a preferable future state of ROE proceedings. Regarding the "science" aspect, much of the time spent litigating the traditional models can be dispensed in favor of a simple application of the CAPM. Then, the "art" of incorporating broader policy implications can be considered before ultimately awarding the ROE. One of the policy factors is undoubtedly how ratings agencies would react to utilities' lower profit levels. Although the opinions emanating from those firms are likely to allege the increased riskiness of utility debt using similarly distorted logic as what supports the prevailing ROE methodology, this is a legitimate concern to recognize as bond ratings influence the cost of debt. In consideration of this, an attempt to engender fairness in setting the ROE should probably focus on a ruling from FERC as it has interstate jurisdiction; this would prevent ratings agencies from unfairly singling out state commissions which authorize lower returns. Over time, as it

[128] Statement of Commissioner Richard Glick, concurring in part and dissenting in part in *Association of Businesses Advocating Tariff Equity v. Midcontinent Independent System Operator, Inc.*, Opinion No. 569-A, 171 FERC ¶ 61,154 at P 9-10 (2020).

becomes clear that the protestations to reduced ROEs were overwrought, state commissions wouldn't have the standing to continue outmoded methodologies and their approaches would converge towards the truly just and reasonable ROE.

Nonetheless, any "subjective factors" should be viewed skeptically given the current litany of biased practices used to formulate ROEs. There should be acknowledgement that the standards enumerated in *Hope* and *Bluefield* were never realized in an objective sense and this should motivate a fundamental change towards fairness on behalf of regulators, meaning that the self-fulfilling methodology used to uphold the status quo should be discarded. Ultimately, it seems indisputable that ensuring fairness in outcomes depends on acceptance of objective evidence and data rather than appeals to subjective information. The public can judge the efficacy of future ROE proceedings by the degree to which this principle is upheld.

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Appendix

Supporting data and calculations for the Figures and Exhibits in this analysis are made available at https://github.com/tsikes37/Regulated-Inequity-Repository

Exhibit I: FERC's Risk Premium Results and Inputs

Source: Opinion No. 569-A, 171 FERC ¶ 61,154 Appendix I (2020)

Risk Premium Results

Current Equity Risk Premium	MISO I	MISO II
Average Base ROE Over Study Period	10.53%	10.48%
Average Yield Over Study Period	6.10%	6.02%
Baa Utility Bond Yield	4.65%	5.41%
Change in Bond Yield	-1.45%	-0.61%
Risk Premium/Interest Rate Relationship	-0.7006	-0.6866
Adjustment to Average Risk	1.02%	0.42%
Average Risk Premium over Study Period	4.43%	4.46%
Adjusted Risk Premium	**5.45%**	**4.88%**
Implied Cost of Equity		
Baa Utility Bond Yield	4.65%	5.41%
Adjusted Equity Risk Premium	5.45%	4.88%
Risk Premium Cost of Equity	**10.10%**	**10.29%**

Risk Premium Inputs

Docket Number	Utility	Type	Date	Base ROE	Baa Bond Yield	Implied Risk Premium
ER05- 515	BG&E	Settlement - Uncontested	Feb-06	10.80	6.07	4.73
ER05- 515	BG&E	Settlement - Uncontested	Feb-06	11.30	6.07	5.23
ER05- 925	Westar	Settlement - Uncontested	Jun-06	10.80	6.36	4.44
ER07- 284	SDG&E	Settlement - Uncontested	Feb-07	11.35	6.14	5.21
ER06- 787	Idaho Pwr	Settlement - Uncontested	May-07	10.70	6.15	4.55
ER06- 1320	Wisconsin Elec. Pwr	Settlement - Uncontested	May-07	11.00	6.15	4.85
ER07- 583	Commonwealth Edison	Settlement - Uncontested	Sep-07	11.00	6.41	4.59

ER06- 1549	Duquesne	Settlement - Uncontested	Sep-07	10.90	6.41	4.49
ER08-92	VEPCO	Order	Oct-07	10.90	6.43	4.47
ER08- 374	Atlantic Path	Order	Nov-07	10.65	6.44	4.21
ER08- 413	Startrans IO	Order	Nov-07	10.65	6.44	4.21
ER08- 396	Westar	Declaratory order.	Nov-07	10.80	6.44	4.36
ER08- 686	Pepco Holdings	Order	Jan-08	11.30	6.41	4.89
ER07- 562	Allegheny	Settlement	Feb-08	11.20	6.42	4.78
ER07- 1142	Ariz. Pub. Service	Settlement - uncontested	Apr-08	10.75	6.54	4.21
ER08- 1207	VEPCO	Order	May-08	10.90	6.62	4.28
ER08- 1402	Duqesne	Order	Jun-08	10.90	6.69	4.21
ER08- 1423	Pepco Holdings	Order	Jun-08	10.80	6.69	4.11
ER08- 1584	Black Hlls	Settlement - Uncontested	Jun-08	10.80	6.69	4.11
ER09- 35/36	Tallgrass / Prairie Wind	Commission Order	Jul-08	10.80	6.80	4.00
ER09- 249	Public Service Elec. & Gas	Accepted by FERC	Aug-08	11.18	6.86	4.32
ER09- 548	ITC Great Plains	Settlement - Uncontested	Sep-08	10.66	6.94	3.72
ER09-75	Pioneer	Order	Sep-08	10.54	6.94	3.60
ER09- 187	SoCal Edison	Order on Paper Hearing	Sep-08	10.04	6.94	3.10
ER08- 375	SoCal Edison	Order on Paper Hearing	Nov-08	10.55	7.60	2.95
ER09- 745	Baltimore Gas & Elec.	Accepted by FERC	Dec-08	11.30	7.80	3.50
ER07- 1069	AEP - SPP Zone	Settlement - Uncontested	Jan-09	10.70	7.95	2.75
ER09- 681	Green Power Express	Commission Order	Jan-09	10.78	7.95	2.83
ER08- 281	Oklahoma Gas & Elec.	Settlement - Uncontested	Apr-09	10.60	8.13	2.47
ER08- 1457	PPL Elec. Utilities Corp.	Settlement - Uncontested	Apr-09	11.00	8.13	2.87
ER08- 1457	PPL Elec. Utilities Corp.	Settlement - Uncontested	Apr-09	11.14	8.13	3.01
ER08- 1588	Kentucky Utilities Co.	Settlement - Uncontested	Apr-09	11.00	8.13	2.87
ER08- 552	Niagara Mohawk	Settlement - Uncontested	Jul-09	11.00	7.62	3.38
ER09- 628	National Grid Generation LLC	Settlement - Uncontested	Aug-09	10.75	7.39	3.36
ER08- 313	Southwestern Public Service Co.	Settlement - Uncontested	Aug-09	10.77	7.39	3.38
ER10- 160	SoCal Edison	Order on Paper Hearing	Sep-09	10.33	7.08	3.25
ER08- 1329	AEP - PJM Zone	Settlement - Uncontested	Mar-10	10.99	6.20	4.79
ER10- 230	Kansas City Power & Light Co.	Settlement - Uncontested	Aug-10	10.60	6.05	4.56
ER10- 355	AEP Transcos - PJM	Settlement - Contested	Aug-10	10.99	6.05	4.95
ER10- 355	AEP Transcos - SPP	Settlement - Contested	Aug-10	10.70	6.05	4.66
ER11- 1952	SoCal Edison	Order	Sep-10	10.30	5.93	4.37
EL11-13	Atlantic Grid Operations	Declaratory Order	Oct-10	10.09	5.84	4.26
ER11- 2895	Duke Energy Carolinas	Settlement - Initial Filing	Oct-10	10.20	5.84	4.37
ER11- 2377	Northern Pass Tx	Order	Nov-10	10.40	5.79	4.62
ER12- 2300	PSCo	Order	Nov-10	10.25	5.79	4.47

ER10- 1377	Northern States Power Co. (MN)	Settlement - Uncontested	Mar-11	10.40	5.94	4.46
ER10- 992	Northern States Power Co.	Settlement - Uncontested	Apr-11	10.20	6.00	4.20
ER10- 516	South Carolina Electric and Gas	Settlement - Uncontested	Apr-11	10.55	6.00	4.55
ER11- 4069	RITELine	Order	May-11	9.93	5.98	3.95
ER12- 296	PSEG	Order	Aug-11	11.18	5.71	5.47
ER08- 386	PATH	Settlement - uncontested	Sep-11	10.40	5.57	4.83
ER11- 2560	Entergy Arkansas, Inc.	Settlement - Uncontested	Dec-11	10.20	5.21	4.99
ER11- 2853	PSCo	Settlement - Uncontested	Mar-12	10.10	5.08	5.03
ER11- 2853	PSCo	Settlement - Uncontested	Mar-12	10.40	5.08	5.33
ER12- 1378	Cleco	Settlement - Uncontested	Nov-12	10.50	4.74	5.77
ER12- 2554	Transource Missouri	Settlement - Uncontested	Jan-13	9.80	4.65	5.16
ER12- 778	Puget Sound Energy	Settlement - Uncontested	Jan-13	9.80	4.65	5.16
ER12- 778	Puget Sound Energy	Settlement - Uncontested	Jan-13	10.30	4.65	5.66
ER11- 3643	PacifiCorp Inc.	Settlement - Uncontested	Feb-13	9.80	4.62	5.18
ER12- 1650	Maine Public Service Co.	Settlement - Uncontested	Feb-13	9.75	4.62	5.13
ER11- 3697	SoCal Edison	Settlement - Uncontested	Jul-13	9.30	4.82	4.49
ER13- 941	San Diego Gas and Electric	Settlement - Uncontested	Jan-14	9.55	5.22	4.33
ER12- 1589	PSCo	Settlement	Aug-14	9.72	4.76	4.96
ER12-91	Duke Energy Ohio	Settlement - Uncontested	Sep-14	10.88	4.73	6.15
EL12- 101	Niagara Mohawk	Settlement - Uncontested	Jan-15	9.80	4.66	5.14
ER13- 685	Public Service Company New Mexico	Settlement - Uncontested	Feb-15	10.00	4.62	5.38
ER14- 1661	MidAmerican Central California	Settlement - Uncontested	Mar-15	9.80	4.58	5.22
ER15- 303	American Transmission Systems, Inc.	Settlement - Uncontested	May-15	9.88	4.58	5.30
ER15- 303	American Transmission Systems, Inc.	Settlement - Uncontested	May-15	10.56	4.58	5.98
EL14-93	Westar Energy	Settlement - Uncontested	May-15	9.80	4.58	5.22
EL12-39	Duke Energy Florida	Settlement - Uncontested	Jun-15	10.00	4.65	5.35
ER14- 192	SPS	Settlement - Uncontested	Jul-15	10.00	4.79	5.21
ER13- 2428	Kentucky Utilities	Settlement - Uncontested	Jul-15	10.25	4.79	5.46
ER14- 2751	XEST	Settlement - Uncontested	Sep-15	10.20	5.07	5.13
ER15- 572	New York Transco LLC	Settlement - Uncontested	Oct-15	9.50	5.23	4.27
ER15- 2237	Kanstar Transmission LLC	Settlement - Uncontested	Dec-15	9.80	5.41	4.39
ER15- 2114	Transource West Virginia	Settlement - Uncontested	Dec-15	10.00	5.41	4.59

Highlighted rows apply to MISO II results only

FERC at P 111 of Opinion 569-A indicated the period for the Baa Bond Yield: "We continue to find that the risk premiums should not contain inconsistent dates for the ROEs and for the bond yields. Rather, they should be aligned by corresponding the ROE to the test periods on which it is based. For settlements, the relevant date is the date that parties file the settlement, not when the Commission approves it. Consequently, the six-month time period bond yields should be the six months preceding the settlements. Such information is reflected in the data in Appendix I."

Exhibit II: Utility Proxy Group CAPM Stats

Company	**Ticker**	**Beta Series Start Date**	**Avg Beta**	**Avg Adj Beta**	**2015 Adj Beta**	**Avg Annual Return**	**Value Line Beta**	**Size Adjustment**
Ameren Corporation	AEE	12/27/2002	0.56	0.71	0.69	0.09	0.75	0.91%
American Electric Power Company, Inc.	AEP	12/24/1970	0.58	0.72	0.65	0.10	0.7	-0.36%
ALLETE, Inc.	ALE	4/17/1978	0.52	0.68	0.76	0.10	0.8	1.74%
Avista Corporation	AVA	2/15/1978	0.51	0.67	0.75	0.09	0.8	1.74%
Black Hills Corporation	BKH	2/15/1978	0.55	0.70	0.86	0.14	0.95	1.74%
CMS Energy Corporation	CMS	2/15/1978	0.66	0.78	0.70	0.11	0.75	0.91%
CenterPoint Energy, Inc.	CNP	12/24/1970	0.63	0.75	0.75	0.10	0.8	0.91%
Dominion Energy, Inc.	D	3/29/1985	0.48	0.65	0.63	0.15	0.7	-0.36%
DTE Energy Company	DTE	12/24/1970	0.53	0.68	0.70	0.12	0.75	0.63%
Duke Energy Corporation	DUK	3/29/1985	0.51	0.68	0.55	0.13	0.6	-0.36%
Consolidated Edison, Inc.	ED	12/24/1970	0.50	0.67	0.53	0.13	0.6	0.63%
Empire District Electric Co.	EDE	Inactive Price Series					0.70	1.71%
El Paso Electric Co.	EE	Inactive Price Series					0.70	1.71%
Edison International	EIX	4/17/1978	0.60	0.73	0.68	0.14	0.75	0.63%

Eversource Energy	ES	2/15/1978	0.49	0.66	0.68	0.11	0.75	0.63%
Entergy Corporation	ETR	5/20/1977	0.61	0.74	0.66	0.12	0.7	0.63%
Exelon Corporation	EXC	4/17/1978	0.52	0.68	0.64	0.14	0.7	-0.36%
FirstEnergy Corp.	FE	11/8/2002	0.57	0.71	0.67	0.07	0.7	0.63%
Great Plains Energy Inc.	GXP	Inactive Price Series					0.85	1.06%
IDACORP, Inc.	IDA	2/15/1978	0.55	0.70	0.79	0.10	0.8	1.60%
ITC Holdings Corp	ITC	Inactive Price Series					0.65	1.06%
Alliant Energy Corporation	LNT	2/15/1978	0.49	0.66	0.73	0.11	0.8	0.91%
NextEra Energy, Inc.	NEE	2/15/1978	0.54	0.69	0.68	0.15	0.75	-0.36%
NorthWestern Corporation	NWE	12/21/2012	0.63	0.76	0.75	0.11	0.7	1.74%
OGE Energy Corp.	OGE	2/15/1978	0.53	0.69	0.79	0.10	0.9	0.91%
Otter Tail Corporation	OTTR	2/15/1978	0.52	0.68	0.82	0.10	0.9	1.71%
PG&E Corporation	PCG	5/20/1977	0.53	0.68	0.58	0.09	0.65	-0.36%
Public Service Enterprise Group Incorporated	PEG	12/24/1984	0.61	0.74	0.70	0.15	0.75	0.63%
PNM Resources, Inc.	PNM	2/15/1978	0.62	0.75	0.76	0.09	0.85	1.74%
Pinnacle West Capital Corporation	PNW	2/15/1978	0.55	0.70	0.71	0.09	0.7	0.91%
Portland General Electric Company	POR	3/25/2011	0.55	0.70	0.72	0.08	0.8	1.60%
PPL Corporation	PPL	3/29/1985	0.53	0.69	0.60	0.13	0.65	0.63%
SCANA Corp.	SCG	Inactive Price Series					0.75	0.91%

The Southern Company	SO	1/2/1987	0.41	0.61	0.52	0.15	0.6	-0.36%
Sempra	SRE	6/27/2003	0.67	0.78	0.74	0.14	0.8	-0.36%
TECO Energy, Inc.	TE	Inactive Price Series					0.85	1.06%
UIL Holdings Corp.	UIL	Inactive Price Series					0.80	1.60%
Vectren Corp.	VVC	Inactive Price Series					0.80	1.60%
Westar Energy, Inc.	WR	Inactive Price Series					0.75	1.06%
Xcel Energy Inc.	XEL	2/15/1978	0.50	0.67	0.60	0.12	0.65	0.63%
AVERAGE			**0.55**	**0.70**	**0.69**	**11.35%**	**0.75**	

- Beta Series Start Date, Avg Beta, Avg Adj Beta, and 2015 Adj Beta are calculated using data downloaded from Yahoo Finance.
    - Some companies in the proxy group are no longer active in Yahoo Finance as of December 2021. These are indicated by “Inactive Price Series”.

- Value Line and Size Adjustment are from Trial Staff Initial Br. (I), Attachment A to App. 2 at 6.
    - The following is noted for Beta, column (f):
      “See Ex. MTO-30 at 1: The Value Line Investment Survey (Mar. 22, May 1, & May 22, 2015).”

- Per the above note, 2015 Adj. Beta is calculated by averaging the Adjusted Beta in the Yahoo Finance data from 3/20/21 (the most recent Friday), 5/1/21, and 5/22/2015.

Exhibit III: Trial Staff CAPM Data

Source: Trial Staff Initial Br. (I), Attachment A to App. 2 at 6 and author's calculations

Company	Risk-Free Rate	Risk Premium	Risk Premium - Fernandez (2015)*	Beta	Unadjusted Beta*	Size Adjustment	Implied Cost of Equity: [ROE 1]	Implied Cost of Equity w/Risk Premium - Fernandez (2015): [ROE 2]*	Implied Cost of Equity w/Unadjusted Beta: [ROE 3]*
ALLETE	0.0269	0.0912	0.055	0.8	0.7	0.0174	0.1173	0.0883	0.10814
Alliant Energy	0.0269	0.0912	0.055	0.8	0.7	0.0091	0.1090	0.08	0.09984
Ameren Corp.	0.0269	0.0912	0.055	0.75	0.625	0.0091	0.1044	0.07725	0.093
American Elec Pwr	0.0269	0.0912	0.055	0.7	0.55	-0.0036	0.0871	0.0618	0.07346
Avista Corp.	0.0269	0.0912	0.055	0.8	0.7	0.0174	0.1173	0.0883	0.10814
Black Hills Corp.	0.0269	0.0912	0.055	0.95	0.925	0.0174	0.1309	0.09655	0.12866
CenterPoint Energy, Inc.	0.0269	0.0912	0.055	0.8	0.7	0.0091	0.1090	0.08	0.09984
CMS Energy Corp.	0.0269	0.0912	0.055	0.75	0.625	0.0091	0.1044	0.07725	0.093
Consolidated Edison	0.0269	0.0912	0.055	0.6	0.4	0.0063	0.0879	0.0662	0.06968
Dominion Resources	0.0269	0.0912	0.055	0.7	0.55	-0.0036	0.0871	0.0618	0.07346
DTE Energy Co.	0.0269	0.0912	0.055	0.75	0.625	0.0063	0.1016	0.07445	0.0902
Duke Energy Corp.	0.0269	0.0912	0.055	0.6	0.400	-0.0036	0.0780	0.0563	0.05978
Edison International	0.0269	0.0912	0.055	0.75	0.625	0.0063	0.1016	0.07445	0.0902
El Paso Electric Co.	0.0269	0.0912	0.055	0.7	0.55	0.0171	0.1078	0.0825	0.09416
Empire District Electric Co.	0.0269	0.0912	0.055	0.7	0.55	0.0171	0.1078	0.0825	0.09416
Eversource Energy	0.0269	0.0912	0.055	0.75	0.625	0.0063	0.1016	0.07445	0.0902
Entergy	0.0269	0.0912	0.055	0.7	0.55	0.0063	0.0970	0.0717	0.08336
Exelon Corp.	0.0269	0.0912	0.055	0.7	0.55	-0.0036	0.0871	0.0618	0.07346
FirstEnergy Corp.	0.0269	0.0912	0.055	0.7	0.55	0.0063	0.0970	0.0717	0.08336
Great Plains Energy Inc.	0.0269	0.0912	0.055	0.85	0.775	0.0106	0.1150	0.08425	0.10818
IDACORP, Inc.	0.0269	0.0912	0.055	0.8	0.7	0.016	0.1159	0.0869	0.10674
ITC Holdings Corp	0.0269	0.0912	0.055	0.65	0.475	0.0106	0.0968	0.07325	0.08082
NextEra Energy, Inc.	0.0269	0.0912	0.055	0.75	0.625	-0.0036	0.0917	0.06455	0.0803
NorthWestern Corp.	0.0269	0.0912	0.055	0.7	0.55	0.0174	0.1081	0.0828	0.09446
OGE Energy Corp.	0.0269	0.0912	0.055	0.9	0.85	0.0091	0.1181	0.0855	0.11352
Otter Tail Corp.	0.0269	0.0912	0.055	0.9	0.85	0.0171	0.1261	0.0935	0.12152
PG&E Corp.	0.0269	0.0912	0.055	0.65	0.475	-0.0036	0.0826	0.05905	0.06662
Pinnacle West Capital	0.0269	0.0912	0.055	0.7	0.55	0.0091	0.0998	0.0745	0.08616
PNM Resources	0.0269	0.0912	0.055	0.85	0.775	0.0174	0.1218	0.09105	0.11498
Portland General Elec.	0.0269	0.0912	0.055	0.8	0.7	0.016	0.1159	0.0869	0.10674
PPL Corp.	0.0269	0.0912	0.055	0.65	0.475	0.0063	0.0925	0.06895	0.07652
Pub Service Enterprise Group Inc.	0.0269	0.0912	0.055	0.75	0.625	0.0063	0.1016	0.07445	0.0902
SCANA Corp.	0.0269	0.0912	0.055	0.75	0.625	0.0091	0.1044	0.07725	0.093
Sempra Energy	0.0269	0.0912	0.055	0.8	0.7	-0.0036	0.0963	0.0673	0.08714
Southern Company	0.0269	0.0912	0.055	0.6	0.400	-0.0036	0.0780	0.0563	0.05978
TECO Energy, Inc.	0.0269	0.0912	0.055	0.85	0.775	0.0106	0.1150	0.08425	0.10818
UIL Holdings Corp.	0.0269	0.0912	0.055	0.8	0.7	0.016	0.1159	0.0869	0.10674
Vectren Corp.	0.0269	0.0912	0.055	0.8	0.7	0.016	0.1159	0.0869	0.10674
Westar Energy, Inc.	0.0269	0.0912	0.055	0.75	0.625	0.0106	0.1059	0.07875	0.0945
Xcel Energy, Inc.	0.0269	0.0912	0.055	0.65	0.475	0.0063	0.0925	0.06895	0.07652

MAX	**0.1309**	**0.09655**	**0.12866**
MIN	**0.078**	**0.0563**	**0.05978**
AVG	**0.10445**	**0.076425**	**0.09422**

*Author's calculation

Unadjusted Beta = (Beta – 1/3)*3/2

ROE 1 = Risk-Free Rate + Risk Premium*Beta + Size Adjustment

ROE 2 = Risk-Free Rate + Risk Premium – Fernandez (2015)*Beta + Size Adjustment

ROE 3 = Risk-Free Rate + Risk Premium* Unadjusted Beta + Size Adjustment

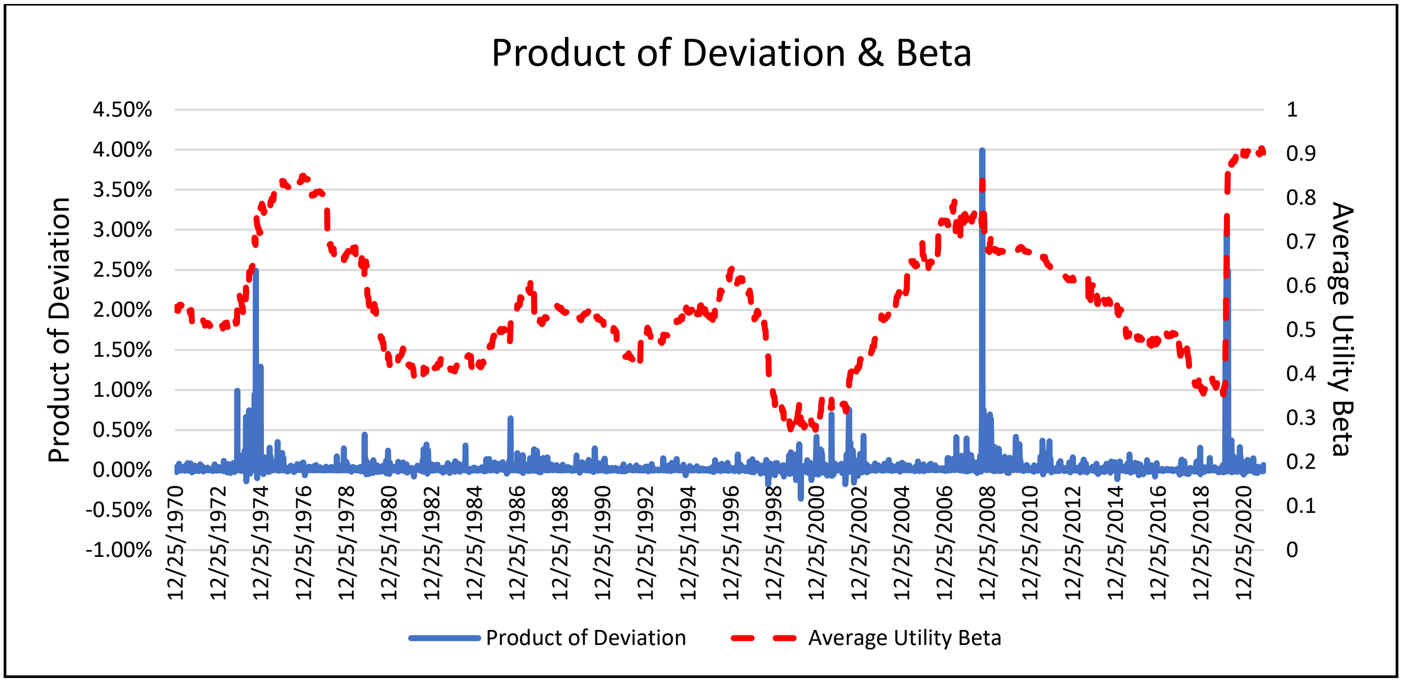
Exhibit IV: Beta & COVID-19

This exhibit further examines the precipitous increase in the sample utility betas which occurred during the onset of the COVID-19 pandemic in spring 2020. Using the data described in Exhibit II of this Appendix, this period saw an increase in the average utility beta from 0.37 on 2/21/20 to 0.88 on 4/10/20. Before proceeding, it's worthwhile to define the calculation of beta in this analysis:

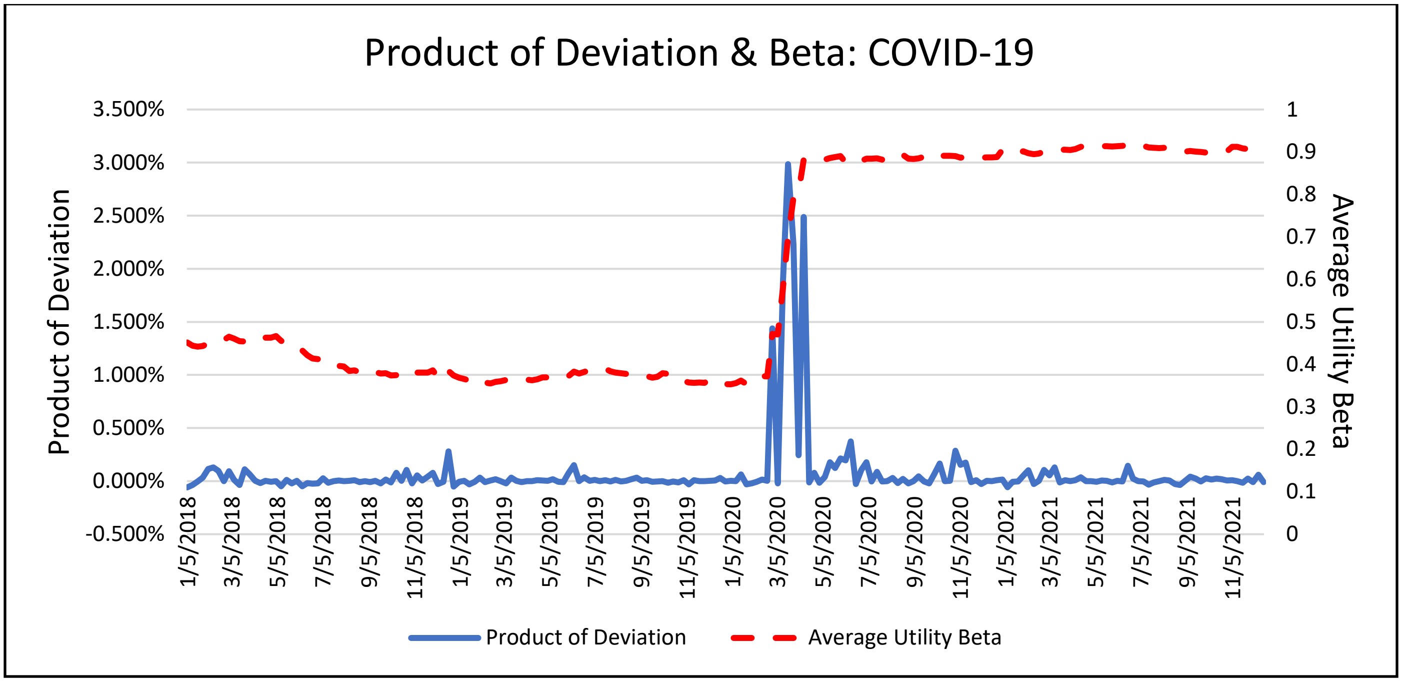
$$B_Y = \frac{COV(X,Y)}{VAR(X)} = \frac{\sum_{i=1}^{260}(X_i - \overline{X})(Y_i - \overline{Y})}{\sum_{i=1}^{260}(X_i - \overline{X})^2}$$

where: B_Y = Beta of Utility Stock Y
COV(X,Y) = Covariance between Returns to NYSE Index (X) and Returns to Utility Stock (Y)
VAR(X) = Variance of Returns to NYSE Index
X_i = Return to NYSE Index in week "i"
Y_i = Return to Utility Stock in week "i"
Xbar = Average Return to NYSE Index
Ybar = Average Return to Utility Stock

Beta is calculated using weekly returns data over a period of five years, i.e. 260 observations on the weekly percentage change in the stock/index price. The terms (X_i – Xbar) and (Y_i – Ybar) represent the deviation of the weekly returns series to its mean over the 260-week period. The product of these terms represents the magnitude to which the NYSE Index and Utility stock returns move together and is herein referred to as the "Product of Deviation". As shown in the below graph, the Product of Deviation is muted over the available history except in instances of financial turmoil.



From examining the data in recent years, shown below, it's clear that the increase in beta which occurred in early 2020 was caused by five large weekly spikes in the Product of Deviation which occurred while the financial markets were experiencing turbulence during the onset of the COVID-19 pandemic. Since then, movements between utility returns and NYSE returns have subsided to normal levels. In early 2025, when the COVID-19 observations no longer factor into the calculation of beta, there should be a precipitous decline in the reported beta. It follows that the average utility beta which stood at ~0.9 as of December 2021 is not representative of the systematic risk of utility stocks which can be expected in future periods.



Date	Average Utility Beta	NYA Deviation	Average Utility Deviation	Product of Deviation
2/14/2020	0.37	1.08%	1.50%	0.02%
2/21/2020	0.37	-0.97%	-0.29%	0.00%
2/28/2020	**0.47**	**-11.48%**	**-12.53%**	**1.44%**
3/6/2020	0.47	-0.30%	6.79%	-0.02%
3/13/2020	**0.58**	**-12.16%**	**-15.36%**	**1.87%**
3/20/2020	**0.70**	**-15.80%**	**-18.90%**	**2.99%**
3/27/2020	**0.79**	**11.54%**	**19.31%**	**2.23%**
4/3/2020	0.81	-2.99%	-8.18%	0.24%
4/10/2020	**0.88**	**12.68%**	**19.63%**	**2.49%**
4/17/2020	0.88	0.61%	-1.97%	-0.01%
4/24/2020	0.88	-1.73%	-4.59%	0.08%

Exhibit V: Application of Modigliani and Miller Model

$$r_e = \rho + (1 - \tau)(\rho - i)\frac{D}{E}$$

where: r_e = cost of equity
ρ = unlevered cost of equity
τ = corporate tax rate
i = current market rate of interest on debt
D/E = debt-to-equity ratio

Example 1
$\tau = 0\%$
$i = 4.65\%$

D/E Ratio	1	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00
Debt %	50%	56%	60%	64%	67%	69%	71%	73%	75%
Unlevered Cost of Equity									
5.33%	6.00%	6.17%	6.34%	6.51%	6.68%	6.84%	7.01%	7.81%	7.35%
6.33%	8.00%	8.42%	8.84%	9.26%	9.68%	10.09%	10.51%	10.93%	11.35%
7.33%	10.00%	10.67%	11.34%	12.01%	12.68%	13.34%	14.01%	14.68%	15.35%
Total Cost of Capital									
	5.33%	5.33%	5.33%	5.33%	5.33%	5.33%	5.33%	5.33%	5.33%
	6.33%	6.33%	6.33%	6.33%	6.33%	6.33%	6.33%	6.33%	6.33%
	7.33%	7.33%	7.33%	7.33%	7.33%	7.33%	7.33%	7.33%	7.33%

Example 2
$\tau = 21\%$
$i = 4.65\%$

D/E Ratio	1	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00
Debt %	50%	56%	60%	64%	67%	69%	71%	73%	75%
Unlevered Cost of Equity									
5.40%	6.00%	6.15%	6.30%	6.45%	6.60%	6.74%	6.89%	7.04%	7.19%
6.52%	8.00%	8.37%	8.74%	9.11%	9.48%	9.85%	10.22%	10.59%	10.69%
7.64%	10.00%	10.59%	11.18%	11.77%	12.36%	12.95%	13.54%	14.13%	14.72%
Total Cost of Capital									
	4.84%	4.77%	4.72%	4.68%	4.65%	4.62%	4.59%	4.57%	4.55%
	5.84%	5.76%	5.70%	5.65%	5.61%	5.57%	5.54%	5.52%	5.49%
	6.84%	6.75%	6.68%	6.62%	6.57%	6.53%	6.49%	6.46%	6.44%

Example 3

$\tau = 35\%$
$i = 4.65\%$

D/E Ratio	1	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00
Debt %	50%	56%	60%	64%	67%	69%	71%	73%	75%
Unlevered Cost of Equity									
5.47%	6.00%	6.13%	6.27%	6.40%	6.53%	6.66%	6.80%	6.93%	7.06%
6.68%	8.00%	8.33%	8.66%	8.99%	9.32%	9.65%	9.98%	10.31%	10.64%
7.89%	10.00%	10.53%	11.05%	11.58%	12.11%	12.63%	13.16%	13.69%	14.22%
Total Cost of Capital									
	4.51%	4.40%	4.32%	4.25%	4.19%	4.14%	4.10%	4.06%	4.03%
	5.51%	5.38%	5.28%	5.19%	5.12%	5.06%	5.01%	4.97%	4.93%
	6.51%	6.36%	6.24%	6.13%	6.05%	5.98%	5.92%	5.87%	5.82%

Written Evidence of Dr. Cleary filed in the 2023 Alberta Generic Cost of Capital Proceedings

Exhibit AU

Valuation Methods

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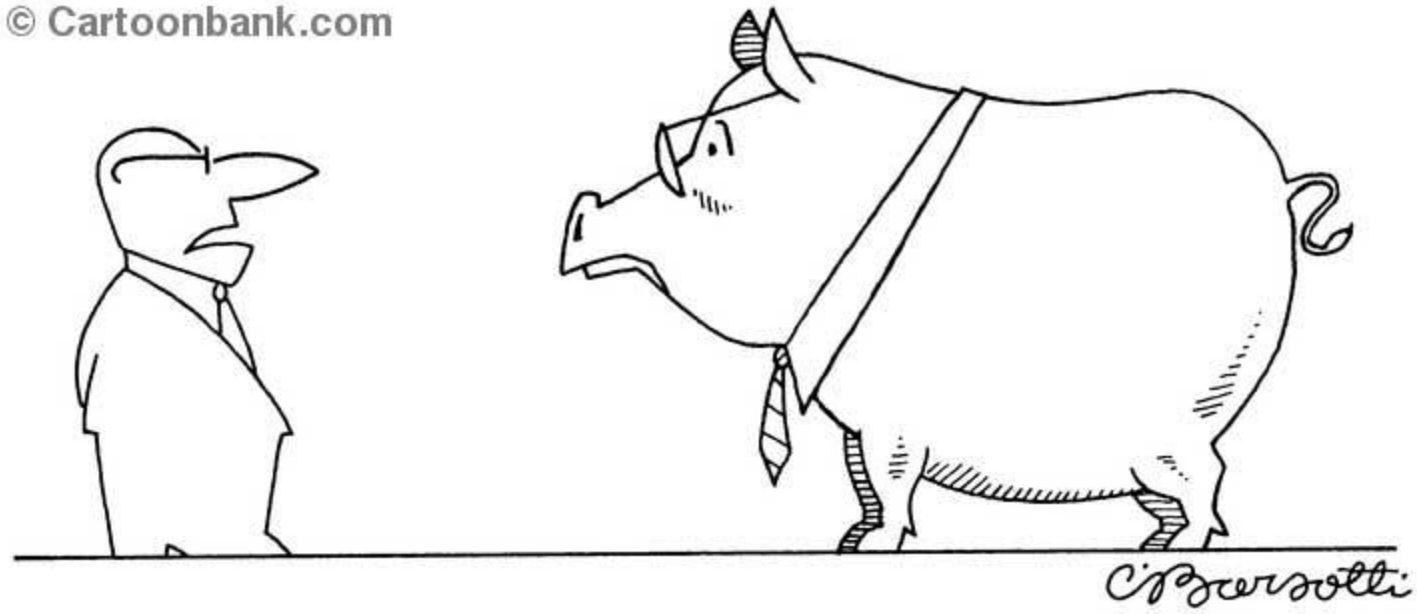
Value is in the eye of the beholder



"Basic economics—sometimes the parts are worth more than the whole."

Valuation Methods

- What do you think the most common valuation approaches used by analysts and portfolio managers are?

October 2007 Survey

- Invited about 13,500 CFA Institute members to participate.
- 2,369 accepted the invitation (17.6% response rate).
- 2,063 evaluate individual securities for purposes of making an investment recommendation or portfolio decision. 1,980 completed sufficient data for analysis.
- Follow securities from the Americas (about 65.9%), Europe, Middle East and Africa (22.5%), and Asia-Pacific (11.6%).
- Primarily buy-side investment analysts and portfolio managers. For those managing portfolios - fairly equally split between managing institutional and individual (private wealth) portfolios.

Valuation Approaches Used

Market Approach	1,838	92.8%
Present Discounted Value Approach (DDM, DCF, RI, etc.)	1,560	78.8%
Asset-Based Approach	1,216	61.4%
Options Approach	99	5.0%
Other	252	12.7%
Total Responses	1,980	

Valuation Approaches Used

- As can be seen from the data, analysts use multiple valuation methods. For example, analysts who say they use a market approach use it on average 68.6% of the time.
- Some approaches may work well in certain industries/economic conditions but not in others. More on this later.

Other Valuation Approaches Used

- LBO/Takeout Value
- Net Asset Value (REITs)
- Sum of the Parts
- Momentum
- Technical Analysis
- ROE/ROIC/CFROI/IRR
- Multifactor Quantitative Models

Market Approach – Ratios Used

D/P or P/D	627	35.5%
Enterprise Value Multiple	1,353	76.7%
P/B	1,042	59.0%
P/CF	1,010	57.2%
P/S	712	40.3%
P/E	1,555	88.1%
Other	205	11.6%
Total Responses	1,765	

Market Approach – P/E

- The E in P/E
  - The majority of respondents who use a P/E approach to valuation use forecast net income in the denominator (61%) followed by forecast operating income (20%).
  - Some use an average, blend or normalized earnings.

Market Approach – P/CF

- Lets review some common cash flow measures.

Free Cash Flow to the Firm

- Sometimes referred to as “debt free” model
- FCFF is the cash flow available to the company’s suppliers of capital after all operating expenses (including taxes) have been paid and operating investments have been made. The company’s suppliers of capital include debtholders and common stockholders (and occasionally preferred stockholders).

Computing FCFF

- Net Income
- + Non Cash Charges
- - Working Capital Investment
- = Operating Cash Flow
- +Interest Expense (1-tax rate)
- - Fixed Capital Investments
- = FCFF

- This computation is for use when interest paid was deducted from operating cash flow (versus financing cash flow). IFRS permits either method.

Free Cash Flow to Equity

- FCFE is free cash flow available to equity holders only.   It is computed after all payments to debt holders (principal and interest).

Computing FCFE

- Can start with FCFF and make adjustments
- FCFF
- - Interest Expense (1- tax rate)
- - Debt Repayment
- +New Debt Borrowing
- =FCFE

Computing FCFE

- Operating Cash Flow
- - Fixed Capital Investment
- - Debt Repayment
- +New Debt Borrowing
- =FCFE

Market Approach – P/CF

- What cash flow measure makes the most sense?

Market Approach - P/CF

- 32% of those using a P/CF measure use P/FCFE
- 29% use P/FCFF
- 22% use P/OCF

- Why might P/OCF be justified?

Market Approach - EV

- 88% of the time EV/EBITDA used
- 21% EV/FCFF
- 19% EV/EBIT
- 17% EV/Revenue

- EBITDA versus FCFF?

Other Multiples Used

- Industry Multiples (e.g., oil reserves, AUM, NAV)
- Relative P/E, PEG
- ROE

Discount Approach

Dividend Discount Model	511	35.1%
Residual Income	298	20.5%
Discounted Free Cash Flow	1,265	86.8%
CFROI	287	19.7%
Other (discounted earnings or EBITDA)	52	3.6%
Total Responses	1,457	

Source of Required Equity Return

CAPM	979	68.2%
APT	69	4.8%
Fama-French	58	4.0%
Bond Yield Plus Risk Premium	613	42.7%
Judgmentally determined hurdle rate	682	47.5%
Other (Build up or market derived)	91	6.3%
Total Responses	1,436	

Multiple Sources of Inputs

- Once again respondents told us they use more than one input source to determine their discount rate.
- For the equity risk premium most use a historical based equity risk premium – perhaps with an adjustment. About a third of the time a forward looking equity risk premium was used.

Dividend Discount Models

- Most indicated they used a two stage or more than two stage model.
- Followed by single stage models (Gordon Growth)
- An H-Model was used by only about 10% of respondents.
- Median number of years forecast is 5 (mean about 7).

Discounted Cash Flow Models

- Similarly DCF Models in order of use were:
  - Two stage FCFF
  - More than two stage FCFF
  - More than two stage FCFE
  - Single stage FCFF
  - Two stage FCFE
- H-Models were used less than 7% of the time.
- Median number of years forecast was 5 years (mean about 8 years).

Residual Income Approach

- Used selectively.
- Majority who did use – used a two or more stage residual income to the firm.
- Most used a generic residual income model (versus a trademarked version).

Traditional Accounting Versus Residual Income

- Lets consider a company that we form by contributing $1 million dollars of equity capital by issuing 100,000 shares for $10 per share.
- Additionally we borrow $1 million at an interest rate of 8%. Terms of the loan are interest payable annually and principal payments are deferred.
- Total capital employed in our business is $2 million.
- Average Tax Rate 30%

Income Statement

Sales	$900,000
Operating Expenses	700,000
EBIT	200,000
Interest Expense	80,000
EBT	120,000
Tax Expense	36,000
Net Income	84,000

Traditional Accounting

- How did we do?
- We were profitable.
- Our Return on Assets was 4.2%
- Our Return on Equity was 8.4%

Is it Enough?

- While traditional accounting and the income statement subtracts the cost of debt capital (interest expense) in arriving at net income it ignores the cost of equity capital. Essentially it treats equity capital as being free.
- However, as investors we demand a return on our equity capital ($1 million in this case).

ROE versus the Cost of Equity

- Lets say that based on our other opportunities and the risk of this particular venture that we have a required return on our equity capital of 10%.
- Clearly the return on equity is lower than our cost of equity.
- The investment has therefore not earned enough to compensate us for the use of our capital.

Income Statement

Sales	$900,000
Operating Expenses	<u>700,000</u>
EBIT	200,000
Interest Expense	<u>80,000</u>
EBT	120,000
Tax Expense	<u>36,000</u>
Net Income	84,000
Equity Charge	<u>100,000</u>
Residual Income	(16,000)

Adding Value

- If the firm earns exactly the cost of capital, residual income will be zero.
- In order to add value for equity capital providers, the firm needs to earn more than the cost of capital. This results in positive residual income.
- Negative residual income leads to a decline in the value of the firm.

- What do you think our firm should be worth if these results were expected consistently in future years?

RI Models and P/B Multiple

$$V_0 = B_0 + \frac{\mathrm{ROE} - r}{r - g} B_0$$

Industry/Sector Differences

- Asset based
  - Real estate, commodities and financials
- Financials
  - P/BV or BV
  - DDM
  - Residual Income
  - Not P/E or FCFF
- Firms with intangible assets
  - DCF

Written Evidence of Dr. Cleary filed in the 2023 Alberta Generic Cost of Capital Proceedings

Exhibit AV

Version: December 8, 1999

The theory and practice of corporate finance: Evidence from the field[1]

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We survey 392 CFOs about the cost of capital, capital budgeting, and capital structure. Large firms rely heavily on present value techniques and the capital asset pricing model, while small firms are relatively likely to use the payback criterion. Firms are concerned about maintaining financial flexibility and a good credit rating when issuing debt, and earnings per share dilution and recent stock price appreciation when issuing equity. We find some support for the pecking-order and trade-off capital structure hypotheses but little evidence that executives are concerned about asset substitution, asymmetric information, transactions costs, free cash flows, or personal taxes.

Key words: capital structure, cost of capital, cost of equity, capital budgeting, discount rates, project valuation, survey.

[1] We thank Franklin Allen for his detailed comments on the survey instrument and the overall project. We appreciate the input of Chris Allen, J.B. Heaton, Craig Lewis, Cliff Smith, Jeremy Stein, Robert Taggart, and Sheridan Titman on the survey questions and design. We received expert survey advice from Lisa Abendroth, John Lynch, and Greg Stewart. We thank Carol Bass, Frank Ryan and Fuqua MBA students for help in gathering the data; and Kathy Benton, Steve Fink, Anne Higgs, Ken Rona, and Ge Zhang for computer assistance. The paper has benefited from comments made by an anonymous referee, Michael Bradley, Alon Brav, Magnus Dahlquist, Paul Gompers, Tim Opler, Nathalie Rossiensky, Rick Ruback, David Smith, and seminar participants at the Harvard Business School/Journal of Financial Economics conference on the interplay between theoretical, empirical, and field research in finance. Finally, we thank the executives who took the time to fill out the survey. This research is partially sponsored by the Financial Executives Institute (FEI). The opinions expressed in the paper do not necessarily represent the views of FEI. A review of certain aspects of corporate finance was produced as part of this research and is available at www.duke.edu/~charvey/Research/indexr.htm.

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1. Introduction

In this paper, we analyze a comprehensive survey that describes the current practice of corporate finance. Perhaps the best-known field study in this area is John Lintner's (1956) path-breaking analysis of dividend policy. The results of that study are still quoted today and have deeply affected the way that dividend policy research is conducted.

In many respects, our goals are similar to Lintner's. Our survey describes the current practice of corporate finance. We hope that researchers will use our results to develop new theories -- and potentially modify or abandon existing views. We also hope that practitioners will learn from our analysis, by noting how other firms operate and by identifying areas where academic recommendations have not been fully implemented.

Our survey is distinguished from previous surveys in a number of dimensions.[2] First, the scope of our survey is broad. We examine capital budgeting, cost of capital and capital structure. This allows us to link responses across areas. For example, we investigate whether firms that consider financial flexibility a capital structure priority also are likely to value real options in capital budgeting decisions. We explore each category in depth, asking more than 100 total questions.

Second, we sample a large cross-section of approximately 4,440 firms. In total, 392 Chief Financial Officers responded to the survey, for a response rate of 9%. The next largest survey that we know of is Moore and Reichert (1983) who study 298 large firms. We investigate for possible nonresponse bias and conclude that our sample is representative of the population.

Third, we analyze the responses conditional on firm characteristics. We examine the relation between the executives' responses and firm size, P/E ratios, leverage, credit rating, dividend policy, industry, management ownership, CEO age, CEO tenure and the education of the CEO. By testing whether responses across these characteristics, we shed light on the implications of various corporate finance theories related to firm size, risk, investment opportunities, transaction costs, informational asymmetry, and managerial incentives.

Survey-based analysis complements research based on large samples and clinical studies. Large sample studies are the most common type of empirical analysis, and have several advantages over other approaches. Most large sample studies offer, among other things, statistical power and cross-sectional variation. However, large sample studies often have weaknesses related to variable specification and the inability to ask qualitative questions. Clinical studies are less common but offer excellent detail and are unlikely to “average away” unique aspects of corporate behavior. However, clinical studies use small samples and their results are often sample-specific.

The survey approach offers a balance between large sample analyses and clinical studies. Our survey analysis is based on a moderately large sample and a broad cross-section of firms. At the same time, we are able to ask very specific and qualitative questions. The survey approach is not without potential problems, however. Surveys measure beliefs and not necessarily actions. Survey analysis faces the risk that the respondents are not representative of

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[2] See, for example, Lintner (1956), Gitman and Forrester (1977), Moore and Reichert (1983), Stanley and Block (1984), Baker, Farrelly, and Edelman (1985), Pinegar and Wilbricht (1989), Wansley, Lane, and Sarkar (1989), Sangster (1993), Donaldson (1994), Epps and Mitchem (1994), Poterba and Summers (1995), Billingsley and Smith (1996), Shao and Shao (1996), Bodnar, Hayt, and Marston (1998), Bruner, Eades, Harris, and Higgins (1998) and Block (1999).

the population of firms, or that the survey questions are misunderstood. Overall, survey analysis is seldom used in corporate financial research, so we feel that our paper provides unique information to aid our understanding of how firms operate.

The results of the survey indicate that firm size significantly affects the practice of corporate finance. For example, large firms are significantly more likely to use net present value techniques and the Capital Asset Pricing Model for project evaluation than are small firms, while small firms are more likely to use the payback criterion. A majority of large firms have a tight or somewhat tight target debt ratio, in contrast to only one-third of small firms.

Executives rely heavily on informal rules when choosing capital structure. The most important factors affecting debt policy are maintaining financial flexibility and having a good credit rating. When issuing equity, respondents are concerned about earnings per share dilution and recent stock price appreciation. We find very little evidence that executives are concerned about asset substitution, asymmetric information, transactions costs, free cash flows, or personal taxes. If respondents behave according to these deeper hypotheses, they apparently do so unknowingly. We acknowledge but do not investigate the possibility that these deeper implications are, for example, impounded into prices and credit ratings, and so executives react to them indirectly.

The paper is organized as follows. In the second section, we present the survey design, the sampling methodology, and discuss some caveats of survey research. In the third section we present our analysis of the practice of capital budgeting. We analyze the cost of capital in the fourth section. In the fifth section we examine capital structure. We offer some concluding remarks in the final section.

2. Methodology

2.1 Design

Our survey focuses on three areas: capital budgeting, cost of capital and capital structure. Based on a careful review of the existing literature, we developed a draft survey that was circulated to a group of prominent academics for feedback. We incorporated their suggestions and revised the survey. We then sought the advice of marketing research experts on the survey design and execution. We made changes to the format of the questions and overall survey design with the goal of minimizing biases induced by the questionnaire and maximizing the response rate.

The survey project is a joint effort with the Financial Executives Institute (FEI). FEI has approximately 14,000 members that hold policy-making positions as CFOs, Treasurers and Controllers at 8,000 companies throughout the United States and Canada. Every quarter, Duke University and the FEI poll these financial officers with a one-page survey on important topical issues (Graham, 1999b). The usual response rate for the quarterly survey is between 8-10%.

Using the penultimate version of the survey, we conducted beta tests at both FEI and Duke University. This involved having graduating MBA students and financial executives fill out the survey, note the required time, and provide feedback. Our beta testers took, on average, 17 minutes to complete the survey. Based on this and other feedback, we made final changes to the wording on some questions. The final version of the survey contained 15 questions, most with subparts, and was three pages long. One section collected demographic information about the sample firms. (The survey appears in Internet Appendix A which can be accessed at http://www.duke.edu/~charvey/Research/indexr.htm.)

We sent out two different versions of the survey, with the questions reordered on each version. There are no significant differences that result from the ordering of the questions.[3]

2.2 Delivery and response

We used two mechanisms to deliver the survey. We sent a mailing from Duke University on February 10, 1999 to each CFO in the 1998 Fortune 500 list. Independently, the FEI faxed out 4,440 surveys to their member firms on February 16, 1999. Three hundred thirteen of the Fortune 500 CFOs belong to the FEI, so these firms received both a fax and a hard copy version. We requested that the surveys be returned by February 23, 1999. To encourage the executives to respond, we offered an advanced copy of the results to interested parties.

We employed a team of 10 MBA students to follow up on the mailing to the Fortune 500 firms with a phone call and possible faxing of a second copy of the survey. On February 23, FEI refaxed the survey to the 4,440 FEI corporations, and we remailed to the Fortune 500 firms, with a new due date of February 26, 1999. This second stage was planned in advance and designed to maximize the response rate.

The executives returned their completed surveys by fax to a third party data vendor. Using a third party ensures that the survey responses are anonymous. We feel that anonymity is important to obtain frank answers to some of the questions. Although we do not know the identity of the survey respondents, we do know a number of firm-specific characteristics, as discussed below.

Three hundred ninety-two completed surveys were returned, for a response rate of nearly 9%. Given the length (three pages) and depth (over 100 total questions) of our survey, this response rate compares favorably to the response rate for the quarterly FEI-Duke survey.[4]

2.3 Summary statistics and data issues

Figure 1 presents summary information about the firms in our sample. The companies range from very small (26% of the sample firms have sales less than $100 million) to very large (42% with sales of at least $1 billion) (see Fig. 1A). In subsequent analysis, we refer to firms with revenues greater than $1 billion as "large". Forty percent of the firms are manufacturers (Fig. 1C). The nonmanufacturing firms are evenly spread across other industries, including financial (15%), transportation and energy (13%), retail and wholesale sales (11%) and high-tech (9%).

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[3] Internet Appendix A contains a copy of the version B of the survey. Version A was similar except that questions 11-14 and questions 1-4 were interchanged. We were concerned that the respondents might fill in the first page or two of the survey but leave the last page blank. If this were the case, we would expect to see a higher proportion of respondents answering the questions that appear as 1-4 in either version of the survey. We find no evidence that the response rate differs depending on whether the questions are at beginning or the end of the survey.

[4] The rate is also comparable to other recent academic surveys. For example, Trahan and Gitman (1995) obtain a 12% response rate in a survey mailed to 700 CFOs. The response rate is higher, 34%, in Block (1999) but he targets CFAs -- not senior officers of particular firms.

In Appendix A, we show that the responding firms are representative of the corporate population for size, industry, and other characteristics.

The median price-earnings ratio is 15. Sixty percent of the respondents have price-earnings ratios of 15 or greater (Fig. 1D). We refer to these firms as growth firms when we analyze how investment opportunities affect corporate behavior. We refer to the remaining 40% of the respondents as non-growth firms.

The distribution of debt levels is fairly uniform (Fig. 1E). Approximately one-third of the sample firms have debt-to-asset ratios below 20%, another third have debt ratios between 20% and 40%, and the remaining firms have debt ratios greater than 40%. We refer to firms with debt ratios greater than 30% as highly levered. The credit-worthiness of the sample is also dispersed (Fig. 1F). Twenty percent of the companies have credit ratings of AA or AAA, 32% have an A credit rating, and 27% have a BBB rating. The remaining 21% have speculative debt with ratings of BB or lower.

Nearly half of the CEOs for the responding firms are between 50 and 59 years old (Fig. 1I). Another 23% are over age 59, a group we refer to as “mature”. Twenty-eight percent of the CEOs are between the ages of 40 and 49. The survey reveals that executives change jobs frequently. Nearly 40% of the CEOs have been in their jobs less than four years, and another 26% have been in their jobs between four and nine years (Fig. 1J). We define the 34% who have been in their jobs longer than nine years as having "long tenure". Forty-one percent of the CEOs have an undergraduate degree as their highest level of educational attainment (Fig. 1K). Another 38% have an MBA and 8% have a non-MBA Masters degree. Finally, the top three executives own at least 5% of the common stock of their firm in 44% of the sample. These CEO characteristics allow us to examine whether managerial incentives or entrenchment affect the survey responses. We also study whether having an MBA affects the choices made by corporate executives.

Fig. 1M shows that 36% of the sample firms seriously considered issuing common equity, 20% considered issuing convertible debt, and 31% thought about issuing debt in foreign markets. Among responding firms, 64% calculate the cost of equity, 63% have publicly traded common stock, 53% issue dividends, and 7% are regulated utilities (Fig. 1N). If issuing dividends is an indication of a reduced informational disadvantage for investors relative to managers (Sharpe and Nyguen, 1995), the dividend issuance dichotomy allows us to examine whether the data support corporate theories based on informational asymmetry.

[Insert Table 1]

Table 1 presents correlations for the demographic variables. Not surprisingly, small companies have lower credit ratings, a higher proportion of management ownership, a lower incidence of paying dividends, a higher chance of being privately owned, and a lower proportion of foreign revenue. Growth firms are likely to be small, have lower credit ratings, and a higher degree of management ownership. Firms that do not pay dividends have low credit ratings.

Below, we perform univariate analyses on the survey responses conditional on each separate firm characteristic. However, because size is correlated with a number of different factors, we perform a robustness check for the non-size characteristics. We split the sample in two, large firms versus small firms. On each size subsample, we repeat the analysis of the responses conditional on firm characteristics other than size. We generally report the findings with respect to non-size characteristics in the text only if they hold on the full sample and the two size subsamples. We also perform a separate robustness check relative to public versus private firms and only report the characteristic-based results in the text if they hold for the full and public samples. The tables contain the full set of results, including those that do not pass these robustness checks.

All in all, the variation in executive and firm characteristics permits a rich description of the practice of corporate finance, and allows us to infer whether corporate actions are consistent with academic theories. We show in Appendix A that our sample is representative of the population from which it was drawn, fairly representative of Compustat firms, and not adversely affected by nonresponse bias.

3. Capital budgeting methods

3.1 Design

This section examines the techniques that firms use to evaluate projects. Previous surveys mainly focus on large firms and suggest that internal rate of return (IRR) is the primary method for evaluation. For example, Gitman and Forrester (1977), in their survey of 103 large firms, find that only 9.8% of firms use net present value as their primary method and 53.6% report IRR as primary method. Stanley and Block (1984) find that 65% respondents report IRR as their primary capital budgeting technique. Moore and Reichert (1983) survey 298 Fortune 500 firms and find that 86% use some type of discounted cash flow analysis. Bierman (1993) finds that 73 of 74 Fortune 100 firms use some type of discounted cash flow analysis. These results are similar to the findings in Trahan and Gitman (1995), who survey 84 Fortune 500 and Forbes 200 best small companies, and Bruner, Eades, Harris and Higgins (1998), who interview 27 highly regarded corporations.[5]

Our survey is distinguished from previous work in several ways. The most obvious difference is that previous work has almost exclusively focused on the largest firms. Second, given that our sample is larger than all previous surveys, we are able to control for many different firm characteristics. Finally, we go beyond NPV vs. IRR analysis and ask whether firms use the following evaluation techniques: Adjusted present value (see Brealey and Myers, 1996), payback period, discounted payback period, profitability index, and accounting rate of return. We also inquire whether firms by-pass discounting techniques and simply use earnings multiples. We are also interested in whether firms use other types of analyses that are taught in many MBA programs, such as simulation analysis and Value at Risk (VaR). Finally, we are interested in the importance of real options in project evaluation (see Myers, 1977).

3.2 Results

Respondents are asked to score how frequently they use the different capital budgeting techniques on a scale of 0 to 4 (0 meaning "never", 4 meaning "always"). In many respects, the results differ from previous surveys, perhaps because we have a more diverse sample. An important caveat here, and throughout the survey, is that the response represents beliefs. We have no way of verifying that the beliefs coincide with actions.

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[5] See www.duke.edu/~charvey/Research/indexr.htm for a review of the capital budgeting literature.

Most respondents select net present value and internal rate of return as their most frequently used capital budgeting techniques (see Table 2). 74.9% of CFOs always or almost always (responses of 4 and 3) use net present value (rating of 3.08). 75.7% of respondents always or almost always use internal rate of return (rating of 3.09). The hurdle rate is also popular.

[Insert Table 2]

The most interesting results come from examining the responses conditional on firm and executive characteristics. Large firms are significantly more likely to use NPV than small firms (rating of 3.42 versus 2.83). There is no difference in techniques used by growth and non-growth firms. Highly levered firms are significantly more likely to use NPV and IRR than firms with small debt ratios. This is not just an artifact of firm size. In unreported analysis, we find a significant difference between high and low leverage small firms as well as high and low leverage large firms. Interestingly, highly levered firms are also more likely to use sensitivity and simulation analysis. Perhaps because they are required in the regulatory process, utilities are more likely to use IRR and NPV and perform sensitivity and simulation analyses. We find that CEOs with MBAs are more likely than non-MBA CEOs to use net present value - but the difference is only significant at the 10% level.

Firms that pay dividends are significantly more likely to use NPV and IRR than are firms that do not pay dividends. This result is also robust to our analysis by size. Public companies are significantly more likely to use NPV and IRR than are private corporations. As the correlation analysis indicates in Table 1, many of these attributes are correlated. For example, private corporations are also smaller firms.

Other than NPV and IRR, the payback period is the most frequently used capital budgeting technique (rating of 2.53). This is surprising because financial textbooks have lamented the shortcomings of the payback criteria for decades. (Payback ignores the time value of money and cash flows beyond the cutoff date; the cutoff is usually arbitrary.) Small firms use the payback period (rating of 2.72) almost as frequently as they use NPV or IRR. In untabulated analysis, we find that among small firms, CEOs without MBAs are more likely to use the payback criterion. The payback is most popular among mature CEOs (rating of 2.83). For both small and large firms, we find that mature CEOs use payback significantly more often than younger CEOs in separate examinations. Payback is also frequently used by CEOs with long tenure (rating of 2.80). Few firms use the discounted payback (rating of 1.56), a method that eliminates one of the payback criteria's deficiencies by accounting for the time value of money.

It is sometime argued that the payback approach is rational for severely capital constrained firms: if an investment project does not pay positive cash flows early on, the firm will cease operations and therefore not receive positive cash flows that occur in the distant future, or else will not have the resources to pursue other investments during the next few years (p. 405, Weston and Brigham, 1981). We do not find any evidence to support this claim because we find no relation between the use of payback and leverage, credit ratings, or dividend policy. Our finding that payback is used by older, longer tenure CEOs without MBAs instead suggests that lack of sophistication is a driving factor behind the popularity of the payback criterion.

A number of firms use the earnings multiple approach for project evaluation. There is weak evidence that large firms are more likely to employ this approach than are small firms. We find that a firm is significantly more likely to use earnings multiples if it is highly levered. The influence of leverage on the earnings multiple approach is also robust across size (i.e., highly levered firms, whether they are large or small, frequently use earnings multiples).

In summary, compared to previous research, our results suggest increased prominence of net present value as an evaluation technique. In addition, the likelihood of using specific evaluation techniques is linked to firm size, firm leverage and CEO characteristics. In particular, small firms are significantly less likely to use net present value. They are also less likely to use supplementary sensitivity and VaR analyses. The next section takes this analysis one step further by detailing the specific methods firms use to obtain the cost of capital, the most important risk factors, and a specific capital budgeting scenario.

4. Cost of capital

4.1 Design

We ask three questions about the cost of capital. The first determines how firms calculate the cost of equity. We explore whether firms use the capital asset pricing model (CAPM), a multibeta CAPM (with extra risk factors in addition to the market beta), average historical returns, or a dividend discount model. Second, we investigate which risk factors corporations account for when determining the cash flow and/or discount rate inputs they use in project valuation. The list of risk factors includes the fundamental factors in Fama and French (1992), momentum as defined in Jegadeesh and Titman (1993), as well as the macroeconomic factors in Chen, Roll and Ross (1986) and Ferson and Harvey (1991). Third, we explore how these models are used. In particular, we consider an example of how a firm evaluates a new project in an overseas market. We are interested in whether the CFOs consider the discount rate project specific.

[Insert Table 3]

4.2 Results

The results in Table 3 indicate that the CAPM is by far the most popular method of estimating the cost of equity capital: 73.5% of respondents always or almost always use the CAPM (rating of 2.92; see also Fig. 1H).[6] The second and third most popular methods are average stock returns and a multibeta CAPM, respectively. Few firms back the cost of equity out from a dividend discount model (rating of 0.91). This sharply contrasts with the findings of Gitman and Mercurio (1982) who find that 31.2% of the participants in their survey used a version of the dividend discount model to establish their cost of capital. While the CAPM is popular, we will show later that it is not clear that the model is applied properly in practice.

The cross-sectional analysis is particularly illuminating. Large firms are much more likely to use the CAPM than are smaller firms (rating of 3.27 versus 2.49, respectively). Smaller firms are more inclined to use a cost of equity capital that is determined by "what investors tell us they require." CEOs with MBAs are more likely to use the single factor CAPM or CAPM with extra risk factors than are non-MBA CEOs; but the difference is only significant for the single-factor CAPM.

We also find that firms with low leverage, or small management ownership, are significantly more likely to use the CAPM. We find significant differences for private versus public firms (public more likely to use the CAPM). This is perhaps expected given that the beta

[6] Gitman and Mercurio (1982) in a survey of 177 Fortune 1000 firms find that only 29.9% of respondents use the CAPM "in some fashion". More recently, Bruner, Eades, Harris and Higgins (1998) find that 85% of their 27 best practice firms use the CAPM or a modified CAPM.

of the private firm could only be calculated via analysis of comparable publicly traded firms. Finally, we find that firms with high foreign sales are more likely to use the CAPM.

Given the sharp difference between large and small firms, it is important to check whether some of these control effects just proxy for size. It is, indeed, the case, that foreign sales proxy for size. Table 1 shows that that there is a significant correlation between percent of foreign sales and size. When we analyze the use of the CAPM by foreign sales controlling for size, we find no significant differences. However, this is not true for some of the other control variables. There is a significant difference in use of the CAPM across leverage that is robust to size. The public/private effect is also robust to size. Finally, the difference in the use of the CAPM based on management ownership holds for small firms but not for large firms. That is, among small firms, CAPM use is inversely related to managerial ownership. There is no significant relation for larger firms.

[Insert Table 4]

Table 4 investigates sources of risk other than market risk, and how they are treated in project evaluation. The format of this table is different from the others. We ask whether, in response to these risk factors, the firm modifies its discount rate, cash flows, both or neither. We report the percentage of respondents for each category. In the cross-tabulations across each of the demographic factors, we test whether the 'neither' category is significantly different conditional on firm characteristics.

Overall, the most important additional risk factors are: interest rate risk, exchange rate risk, business cycle risk, and inflation risk. For the calculation of discount rates, the most important factors are interest rate risk, size, inflation risk, and foreign exchange rate risk. For the calculation of cash flows, many firms incorporate the effects of commodity prices, GDP growth, inflation and foreign exchange risk.

Interestingly, few firms adjust either discount rates or cash flows for book-to-market, distress, or momentum risks. Only 13.1% of respondents consider the book-to-market ratio in either the cash flow or discount rate calculations. Momentum is only considered important by 11.1% of the respondents.

Small and large firms have different priorities when adjusting for risk. For large firms, the most important risk factors (in addition to market risk) are foreign exchange risk, business cycle risk, commodity price risk, and interest rate risk. This closely corresponds to the set of factors detailed in Ferson and Harvey (1993) in their large-sample study of multi-beta international asset pricing models. Ferson and Harvey find that the most important additional factor is foreign exchange risk. Table 4 shows that foreign exchange risk is by far the most important additional risk factor for large firms (61.7% of the large firms adjust for foreign exchange risk; the next closest is 51.4% adjusting for business cycle risk). The ordering is different for small firms. Small firms are more affected by interest rate risk than they are by foreign exchange risk.

As might be expected, firms with considerable foreign sales are sensitive to unexpected exchange rate fluctuations. Fourteen percent of firms with substantial foreign exposure adjust discount rates for foreign exchange risk, 22% adjust cash flows, and 32% adjust both. These figures represent the highest incidence of "adjusting something" for any type of risk for any demographic.

There are some interesting observations for the other control variables. Highly levered firms are more likely to consider business cycle risk important; however, surprisingly, indebtedness does not affect whether firms adjust for interest rate risk, term structure risk, or distress risk.

Growth firms are much more sensitive to foreign exchange risk than are non-growth firms. Manufacturing firms are more sensitive to interest rate risk than non-manufacturing firms.

[Insert Table 5]

We examine one final capital budgeting issue. Table 5 investigates the evaluation of a project in an overseas market. Remarkably, most firms would use a single company-wide discount rate to evaluate the project. 58.8% of the respondents would always or almost always use the company-wide discount rate, even though the hypothetical project would most likely have different risk characteristics.[7] A close second, 51% of the firms said they would always or almost always use a risk-matched discount rate to evaluate this project. The reliance of many firms on a company-wide discount rate might make sense if these same firms adjust cash flows for FX risk when considering risk factors (i.e., in Table 4). However in untablulated results, we find the opposite: firms that do not adjust cash flows for FX risk are also relatively less likely (compared to firms that adjust for FX risk) to use a risk-matched discount rate when evaluating an overseas project.

Large firms are significantly more likely to use the risk-matched discount rate than are small firms (rating of 2.34 versus 1.86). This is also confirmed in our analysis of Fortune 500 firms, who are much more likely to use the risk-matched discount rate than the firm-wide discount rate to evaluate the foreign project (rating of 2.61 versus 1.97). Very few firms use a different discount rate to separately value different cash flows within the same project (rating of 0.66).

The analysis across firm characteristics reveals some interesting patterns. Growth firms are more likely to use a company-wide discount rate to evaluate projects. Surprisingly, firms with foreign exposure are significantly more likely to use the company-wide discount rate to value an overseas project. Public corporations are more likely to use a risk-matched discount rate than are private corporations; however, this result is not robust to controlling for size. CEOs with short tenures are more likely to use a company-wide discount rate (significant at the 5% level for both large and small firms).

5. Capital structure

Our survey has separate questions about debt, equity, debt maturity, convertible debt, foreign debt, target debt ratios, credit ratings, and actual debt ratios. Instead of stepping through the responses security-by-security, this section distills the most important findings from the capital structure questions and presents the results grouped by theoretical hypothesis or concept. These groupings are neither mutually exclusive nor all encompassing; they are intended primarily to organize the exposition. The Internet appendix contains a detailed security-by-security discussion of the results.

[7] These results are related to Bierman (1993) who finds that 93% of the Fortune 100 industrial firms use the company-wide weighted average cost of capital for discounting. 72% used the rate applicable to the project based on the risk or the nature of the project. 35% used a rate based on the division's risk.

5.1 Trade-off theory of capital structure choice

5.1.a Target debt ratios and the costs and benefits of debt

One of the longest-standing unresolved questions about capital structure is whether firms have target debt ratios. The trade-off theory says that firms have optimal debt-equity ratios, which they determine by trading off the benefits of debt with the costs (e.g., Scott, 1976). In traditional trade-off models, the chief benefit of debt is the tax advantage of interest deductibility (Modigliani and Miller, 1963). The primary costs are those associated with financial distress and the personal tax expense bondholders incur when they receive interest income (Miller, 1977).[8]

[Insert Table 6]

The CFOs tell us that the corporate tax advantage of debt is moderately important in capital structure decisions: Row a of Table 6 shows that the mean response is 2.07 on a scale from 0 to 4 (0 meaning not important, 4 meaning very important). The tax advantage is most important for large, regulated, and dividend-paying firms – companies that probably have high corporate tax rates and therefore large tax incentives to use debt. Desai (1998) shows that firms issue foreign debt in response to relative tax incentives, so we investigate whether firms issue debt when foreign tax treatment is favorable. We find that favorable foreign tax treatment relative to the U.S. is relatively important (overall rating of 2.26 in Table 7). Big firms (2.41) with large foreign exposure (2.50) are relatively likely to indicate that foreign tax treatment is an important factor. This could indicate that firms need a certain level of sophistication and exposure to perform international tax planning.

[Insert Table 7]

In contrast, we find very little evidence that firms directly consider personal taxes when deciding on debt policy (rating of 0.68 in Table 6) or equity policy (rating of 0.82 in Table 8, the least popular equity issuance factor). Therefore, it seems unlikely that firms target investors in certain tax clienteles (although we can not rule out the possibility that investors choose to invest in firms based on payout policy, or that executives respond to personal tax considerations to the extent that they are reflected in market prices).

[Insert Table 8]

When we ask firms directly about whether potential costs of distress affect their debt decisions, we find they are not very important (rating of 1.24 in Table 6), although they are relatively important among speculative-grade firms. However, firms are very concerned about their credit ratings (rating of 2.46, the second most important debt factor), which might be an indication of concern about distress costs. Among firms that have rated debt and for utilities, credit ratings are a very important determinant of debt policy. Credit ratings are also important for large firms (3.14) that are in the Fortune 500 (3.31). Finally, CFOs are also concerned about earnings volatility when making debt decisions (rating of 2.32), which is consistent with reducing debt usage when the probability of bankruptcy is high (Castanias, 1983).

We ask directly whether firms have an optimal or "target" debt-equity ratio. Nineteen percent of the firms do not have a target debt ratio or target range (see Figure 1G). Another 37% have a flexible target, and 34% have a somewhat tight target or range. The remaining 10% have

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[8] In this section we discuss the traditional factors in the trade-off theory: distress costs and tax costs and benefits. Many additional factors (e.g., informational asymmetry, agency costs) can be modeled in a trade-off framework. We discuss these alternative costs and benefits in separate sections below.

a very strict target debt ratio. These overall numbers provide mixed support for the notion that companies trade off costs and benefits to derive an optimal debt ratio. However, untabulated analysis shows that firms have target debt ratios is stronger among large firms: 55% of large firms have at least somewhat strict target ratios, compared to 36% of small firms. Targets that are tight or somewhat strict are more common among investment grade (64%) than speculative firms (41%), and among regulated (67%) than unregulated firms.Targets are important if the CEO has short tenure or is young, and when the top three officers own less than 5% of the firm.

Finally, the CFOs tell us that their companies issue equity to maintain a target debt-equity ratio (rating of 2.26; row e of Table 8), especially if their firm is highly levered (2.68), firm ownership is widely dispersed (2.64), or the CEO is young (2.41).

5.1.b Deviations from target debt ratios

Actual debt ratios vary across firms and through time. Such variability might occur if debt intensity is measured relative to the market value of equity, and yet firms do not rebalance their debt lock-step with changes in equity prices. Our evidence supports this hypothesis: the mean response of 1.08 indicates that firms do not rebalance in response to market equity movements (row g in Table 9). Further, among firms targeting their debt ratio, few firms (rating of 0.99) state that changes in the price of equity affect their debt policy. In their large-sample study of Compustat firms, Opler and Titman (1998) also find that firms issue equity after stock price increases, which they note is inconsistent with target debt ratios because it moves firms further from any such target.

[Insert Table 9]

Fisher, Heinkel and Zechner (1989) propose an alternative explanation of why debt ratios vary over time, even if firms have a target. If there are fixed transactions costs to issuing or retiring debt, a firm only rebalances when its debt ratio crosses an upper or lower hurdle. We find moderate evidence that firms consider transactions costs when making debt issuance decisions (rating of 1.95 in row e of Table 6), especially among small firms (2.07) in which the CEO has been in office for at least ten years (2.22). Many papers (e.g., Titman and Wessels, 1988) interpret the finding that small firms use relatively little debt as evidence that transaction costs discourage debt usage among small firms; as far as we know, our analysis is the most direct examination of this hypothesis to date. However, when we ask the whether they *delay* issuing (rating of 1.06 in Table 9) or retiring debt (1.04) because of transactions costs, the support for the transactions cost hypothesis is weak.

5.2 Asymmetric information explanations of capital structure

5.2.a Pecking-order model of financing hierarchy

The pecking-order model of financing choice assumes that firms do not target a specific debt ratio, but instead use external financing only when internal funds are insufficient. External funds are less desirable because informational asymmetries between management and investors imply that external funds are undervalued in relation to the degree of asymmetry (Myers and Majluf, 1984; Myers, 1984). Therefore, if firms use external funds, they prefer to use debt, convertible securities, and, as a last resort, equity.

Myers and Majluf (1984) assume that firms seek to maintain financial slack to avoid the need for external funds. Therefore, if we find that firms value financial flexibility, this is generally consistent with the pecking-order theory. However, flexibility is also important for reasons unrelated to the pecking-order model (e.g. Froot et al., 1993; and Opler et al., 1999), so finding that CFOs value financial flexibility is not sufficient to prove that the pecking-order model is the true description of capital structure choice.

We ask several questions related to the pecking-order model. We ask if firms issue securities when internal funds are not sufficient to fund their activities, and separately ask if equity is used when debt, convertibles, or other sources of financing are not available. We also inquire whether executives consider equity undervaluation when deciding which security to use, and whether financial flexibility is important.

Flexibility: The most important item affecting corporate debt decisions is management's desire for "financial flexibility," with a mean rating of 2.59 (Table 6).[9] Fifty-nine percent of the respondents say that flexibility is important (rating of 3) or very important (rating of 4).[10] However, the importance of flexibility in the survey responses is not related to informational asymmetry (size or dividend payout) or growth options in the manner suggested by the pecking-order theory. In fact, flexibility is statistically more important for dividend-paying firms, opposite the theoretical prediction (if dividend-paying firms have relatively little informational asymmetry). Therefore, a deeper investigation indicates that the desire for financial flexibility is not driven by the factors behind the pecking-order theory.[11]

Internal funds deficit: Having insufficient internal funds is a moderately important influence on the decision to issue debt (rating of 2.13, row a in Table 9). This behavior is generally consistent with the pecking-order model. More small firms (rating of 2.30) than large firms (1.88) indicate that they use debt in the face of insufficient internal funds, which is consistent with the pecking-order if small firms suffer from larger asymmetric-information-related equity undervaluation. However, there is only modest evidence that firms issue equity because recent profits have been insufficient to fund activities (1.76 in Table 8), and even less indicating that firms issue equity after their ability to obtain funds from debt or convertibles is diminished (rating of 1.15 in Table 10).

[Insert Table 10]

Equity undervaluation: Firms are reluctant to issue common stock when they perceive that it is undervalued (rating of 2.69, the most important equity issuance factor in Table 8). In a separate survey conducted one month after ours, when the Dow Jones 30 was approaching a new record of 10,000, Graham (1999b) finds that more than two-thirds of FEI executives feel that their common equity is undervalued by the market. Taken together, these findings indicate that a large percentage of firms are hesitant to issue common equity because they feel their

[9] Four firms wrote in explicitly that they remain flexible in the sense of minimizing interest obligations, so that they do not need to shrink their business in case an economic downturn occurs in the future (see Internet Appendix). In untabulated analysis, we find that firms that value financial flexibility are more likely to value real options in project evaluation but the difference is not significant.

[10] This finding is interesting because Graham (1999a) shows that firms use their financial flexibility (i.e., preserve debt capacity) to make future expansions and acquisitions, but they appear to retain a lot of unused flexibility even after expanding.

[11] Pinegar and Wilbricht (1989) survey 176 unregulated, nonfinancial Fortune 500 firms. Like us, they find that flexibility is the most important factor affecting financing decisions, and that bankruptcy costs and personal tax considerations are among the least important. Our analysis, examining a broader cross-section of theoretical hypotheses and using information on firm and executive characteristics, shows that the relative importance of these factors is robust to a more general survey design.

stock is undervalued. Rather than issuing equity when they feel it is undervalued, many firms issue convertible debt instead: Equity undervaluation is the second most popular factor affecting convertible debt policy (rating of 2.34 in Table 10), a response particularly popular among growth firms (2.72).

Finding that firms avoid equity when they perceive that it is undervalued is generally consistent with the pecking order. However, when we examine more carefully how equity undervaluation affects financing decisions, the support for the pecking-order model wanes. In debt decisions, large (rating of 1.76 in row d of Table 9), dividend-paying (1.65) firms are relatively more likely to say that equity undervaluation affects their debt policy (relative to ratings of 1.37 for both small and non-dividend-paying firms). In equity decisions, the relative importance of stock valuation on equity issuance is not related to informational asymmetry as indicated by small size and nondividend-paying status, though it is more important for firms with low executive ownership. In general, these findings are not consistent with the pecking-order idea that informationally-induced equity undervaluation causes firms to avoid equity financing.[12]

In sum, the importance of financial flexibility and equity undervaluation to security issuance decisions is generally consistent with the pecking-order model of financing hierarchy. However, asymmetric information does not appear to *cause* the importance of these factors, as it should if the pecking-order is the true model of capital structure choice.

5.2.b Recent increase in price of common stock

We investigate whether firms issue stock during a "window of opportunity" that arises because their stock price has recently increased, as argued by Loughran and Ritter (1995). Lucas and McDonald (1990) put an informational asymmetry spin on the desire of firms to issue equity after stock price increases: If a firm's stock price is undervalued due to informational asymmetry, it delays issuing until after an informational release (of good news) and the ensuing increase in stock price.

Recent stock price performance is the third most popular factor affecting equity issuance decisions (rating of 2.53 in Table 8), in support of the "window of opportunity." Consistent with Lucas and McDonald (1990), the window of opportunity is most important for firms suffering from informational asymmetries (i.e., not paying dividends).

5.2.c Signaling private information with debt and equity

Ross (1977) and Leland and Pyle (1977) argue that firms use capital structure to signal their quality or future prospects. However, very few firms indicate that their debt policy is affected by factors consistent with signaling (rating of 0.96 in Table 9). In addition to small absolute importance, companies more likely to suffer from informational asymmetries, such as small private (0.51) firms, are relatively unlikely to use debt to signal future prospects (see row b in Table 9). We also find little evidence that firms issue equity to give the market a positive impression of their prospects (rating of 1.31 in Table 8). Sending a positive signal via equity issuance is relatively more popular among speculative, nondividend-paying firms.

[12] Helwege and Liang (1996) find that "asymmetric information variables have no power to predict the relative use of public bonds over equity."

5.2.d Private information and convertible stock issuance

Private information about asset risk: Brennan and Kraus (1987) and Brennan and Schwartz (1988) argue that the call or conversion feature makes convertible debt relatively insensitive to asymmetric information (between management and investors) about the risk of the firm. We find moderate support for this argument: Firms use convertible debt to attract investors unsure about the riskiness of the company (rating of 2.07 in Table 10). This response is relatively more popular among firms for which outside investors are likely to know less than management about firm risk: small firms (2.35) with large managerial ownership (2.47).

Private information about stock price: Stein (1992) argues that if firms privately know that their stock is undervalued, they prefer to avoid issuing equity. At the same time, they want to minimize the distress costs that come with debt issuance. Convertible debt is "delayed" common stock that has lower distress costs than debt and smaller undervaluation than equity. We find strong evidence consistent with Stein's (1992) argument that convertibles are "back-door equity." Among firms that issue convertible debt, the most popular factor is that convertibles are an inexpensive way to issue delayed common stock (rating of 2.49 in Table 10).[13]

5.2.e Anticipating improvement in credit ratings

Having private information about credit quality can affect a firm's optimal debt maturity. If firms privately know they are high-quality but are currently assigned a low credit rating, they issue short-term debt because they expect their rating to improve (Flannery, 1986; and Kale and Noe, 1990). The evidence that firms time their credit-worthiness is weak. The mean response is only 0.85 (row e, Table 11) that companies borrow short-term because they expect their credit rating to improve. This response receives more support from companies with speculative grade debt (1.18), and that do not pay dividends (0.99). Though not of large absolute magnitude, this last answer is consistent with firms timing their credit ratings when they are subject to large informational asymmetries.

[Insert Table 11]

5.2.f Timing market interest rates

Although relatively few executives time changes in their credit ratings (something about which they might reasonably have private information), we find surprising indications that they try to time the market in other ways. We inquire whether executives attempt to time interest rates by issuing debt when they feel that market interest rates are particularly low. The rating of 2.22 in Table 6 provides moderately strong evidence that firms try to time the market in this sense. Market timing is especially important for large firms (2.40), which implies that companies are more likely to time interest rates when they have a large or sophisticated debt issuance department.

We also find evidence that firms issue short-term debt in an effort to time market interest rates. CFOs issue short-term when they feel that short rates are low relative to long rates (1.89 in Table 11) or when they expect long-term rates to decline (1.78). Finally, we check if firms use foreign debt because foreign interest rates are lower than domestic rates. There is moderate

[13]CFOs assign a mean rating of 2.18 to using convertibles to avoid equity dilution in the short-term.

evidence that relatively low foreign interest rates affect the decision to issue abroad (rating of 2.19). Though insignificant, small (2.33), growth (2.27) firms are more likely to make this claim. If covered interest rate parity holds, it is not clear to us why firms pursue this strategy.

5.3 Agency costs

5.3.a Conflicts between bondholders and equityholders

Underinvestment: Myers (1977) argues that investment decisions can be affected by the presence of long-term debt in a firm's capital structure. Shareholders may "underinvest" and pass up positive NPV projects if they perceive that the profits will be used to pay off existing debtholders. This cost is most acute among growth firms. Myers (1977) argues that firms may want to limit total debt, or use short-term debt, to minimize underinvestment costs. (Froot, Scharstein, and Stein (1993) argue that firms may want to hedge or otherwise maintain financial flexibility to avoid these costs of underinvestment.)

We ask firms if their choice between short- and long-term debt, or overall debt policy, is related to their desire to pay long-term profits to shareholders, not debtholders. The absolute number of firms indicating that their debt policy is affected by underinvestment concerns is small (rating of 1.01 in Table 6). However, more growth (1.09) than nongrowth firms (0.69) are likely to indicate that underinvestment problems are a concern, which is consistent with the theory. We find little support for the idea that short-term debt is used to alleviate the underinvestment problem. The mean response is only 0.94 (row d in Table 11) that short-term borrowing is used to allow returns from new projects to be captured by long-term shareholders, and there is no statistical difference in the response between growth and nongrowth firms.

Overall, support for the underinvestment argument is weak. This is interesting because it contrasts with the finding in many large sample studies that debt usage is inversely related to growth options (i.e., market-to-book ratios), which those studies interpret as evidence that underinvestment costs affects debt policy.

Asset substitution: Stockholders capture investment returns above those required to service debt payments and other liabilities, and at the same time have limited liability when returns are insufficient to fully pay debtholders. Therefore, stockholders prefer high-risk projects, in conflict with bondholder preferences. Leland and Toft (1996) argue that using short-term debt reduces this agency conflict (see also Barnea, Haugen, and Senbet (1980)). In contrast to this hypothesis, however, we find little evidence that executives issue short-term debt to minimize asset substitution problems. The mean response is only 0.53 (Table 11) that executives feel that short-term borrowing reduces the chance that shareholders will want to take on risky projects.

Green (1984) argues that convertible debt can circumvent the asset-substitution problem that arises when firms accept projects that are riskier than bondholders would prefer. However, we find little evidence that firms use convertibles to protect bondholders against unfavorable actions by managers or stockholders (rating 0.62 in Table 10).

5.3.b Conflicts between managers and equityholders

Jensen (1986) and others argue that when a firm has ample free cash flow, its managers may squander the cash by consuming perquisites or making inefficient investment decisions. We inquire whether firms use debt to commit to pay out free cash flows and thereby discipline management into working efficiently along the lines suggested by Jensen's (1986). We find very little evidence that firms discipline managers in this way (mean rating of 0.33, the second lowest rating among all factors affecting debt policy in Table 6).

5.4. Product market and industry factors

Bradley, Jarrell, and Kim (1984) find that debt ratios differ markedly across industries. One explanation for this pattern is that the product market environment or nature of competition varies across industries in a way that affects optimal debt policy. For example, Titman (1984) suggests that customers avoid purchasing a firm's products if they think that the firm may go out of business, and therefore not stand behind its products, especially if the products are unique; consequently, firms that produce unique products may avoid using debt.

Brander and Lewis (1986) model another way that production and financing decisions can be intertwined. Brander and Lewis hypothesize that, by using substantial debt, a firm can provide a credible threat to rivals that it will not reduce production.

We find little evidence that product market factors affect debt decisions. Executives assign a mean rating of 1.24 to the proposition that debt should be limited so that a firm's customers or suppliers do not become concerned that the firm may go out of business (Table 6). Moreover, high-tech firms (which we assume produce unique products) are *less* likely than other firms to limit debt for this reason, contrary to Titman's prediction. We do find that, in comparison to nongrowth firms (1.00), relatively many growth firms (1.43) claim that customers might not purchase their products if they are worried that debt usage might cause the firm to go out of business. This is consistent with Titman's theory if growth firms produce unique products. Finally, there is no evidence supporting the Brander and Lewis hypothesis that debt provides a credible production threat (rating of 0.40).

Though we do not find much evidence that product market factors drive industry differences in debt ratios, we ask executives whether their capital structure decisions are affected by the financing policy of other firms in their industries. This is important because some papers define a firm's target debt ratio as the industry-wide ratio (e.g., Opler and Titman, 1998; and Gilson, 1997).

We find only modest evidence that managers are concerned about the debt levels of their competitors (rating of 1.49 in Table 6). (Recall, however, that credit ratings are important to debt decisions and note that industry debt ratios are an important input for bond ratings.) Rival debt ratios are relatively important for regulated companies (2.32), Fortune 500 firms (1.86), public firms (rating of 1.63 versus 1.27 for private firms), and firms that target their debt ratio (1.60). Moreover, equity issuance decisions are not influenced greatly by the equity policies of other firms in a given industry (rating of 1.45 in Table 8). Finally, we find even less evidence that firms use convertibles because other firms in their industry do so (1.10 in Table 10).

5.5 Control contests

Capital structure can be used to influence, or can be affected by, corporate control contests and managerial share ownership (e.g., Harris and Raviv (1988) and Stulz (1988)). We find moderate evidence that firms issue equity to dilute the stock holdings of certain shareholders (rating of 2.14 in Table 8). This tactic is popular among speculative-grade companies (2.24); however, it is not related to the number of shares held by managers. We also ask if firms use debt to reduce the likelihood that the firm will become a takeover target. We find little support for this hypothesis (rating of 0.73 in Table 6).

5.6 Risk management

Capital structure can be used to manage risk. Gèczy, Minton, and Schrand (1997) note that "foreign denominated debt can act as a natural hedge of foreign revenues" and displace the need to hedge with currency derivatives. We ask whether firms use foreign debt because it acts as a natural hedge, and separately how important it is to keep the source close to the use of funds. Among the 31% of respondents who seriously considered issuing foreign debt, the most popular reason they did so is to provide a natural hedge against foreign currency devaluation (mean rating of 3.15 in Table 7). Providing a natural hedge is most important for public firms (3.21) with large foreign exposure (3.34). The second most important factor affecting the use of foreign debt is keeping the source close to the use of funds (rating of 2.67), especially for small (3.09), manufacturing firms (2.92).

Risk-management practices can also explain why firms match the maturity of assets and liabilities. If asset and liability duration are not aligned, interest rate fluctuations can affect the amount of funds available for investment and day-to-day operations. We ask firms how they choose debt maturity. The most popular explanation of how firms choose between short- and long-term debt is that they match debt maturity with asset life (rating of 2.60 in Table 11). Maturity-matching is most important for small (2.69), private (2.85) firms.

5.7 Practical, cash management considerations

Liquidity and cash management concerns affect corporate financial decisions, often in ways that are not as "deep" as the factors driving academic models. For example, many companies issue long-term so that they do not have to refinance in "bad times" (rating of 2.15 in Table 11). This is especially important for highly-levered (2.55), manufacturing (2.37) firms. The CFOs also say that equity is often issued simply to provide shares to bonus/option plans (2.34 in Table 8), particularly among investment grade firms (2.77) with a young CEO (2.65).

The hand-written responses indicate that practical considerations affect the maturity structure of borrowing (see B.7 in Internet Appendix B). Four firms explicitly say that they tie their scheduled principle repayments to their projected ability to repay. Another six diversify debt maturity to limit the magnitude of their refinancing activity in any given year. Other firms borrow for the length of time they think they will need funds, or borrow short-term until sufficient debt has accumulated to justify borrowing long-term.

5.8. Other factors affecting capital structure

5.8.a. Debt

We ask if having debt allows firms to bargain for concessions from employees (Chang, 1992; and Hanka, 1998). We find no indication that this is the case (mean rating of 0.16 in Table 6, the lowest rating for any question on the survey). Not a single respondent said that debt is important or very important bargaining device (rating of 3 or 4). We also check if firms issue debt after recently accumulating substantial profits (Opler and Titman (1998)). The executives do not recognize this as an important factor affecting debt policy (rating 0.53 in Table 9).

Fourteen firms write that they choose debt to minimize their WACC (see B.5 in Internet Appendix B). Ten write, essentially, that they borrow to fund projects or growth, but only as needed. Five indicate that bond or bank covenants affect their debt policy.

5.8.b Common stock

EPS dilution: We investigate whether concern about earnings dilution affects equity issuance decisions. The textbook view is that earnings are not diluted if a firm earns the required return on the new equity.[14] And yet, Brealey and Myers (1996) indicate that there is a common belief among executives that share issuance dilutes earnings per share (on page 396, Brealey and Myers call this view a "fallacy"). To investigate this issue, we ask if earnings per share concerns affect decisions about issuing common stock.

Among the 38% of firms that seriously considered issuing common equity during the sample period, earnings dilution is the most important concern affecting their decision (mean rating of 2.84 in Table 8).[15] The popularity of this response is intriguing. It either indicates that executives focus more than they should on earnings dilution (if the standard textbook view is correct), or that the standard textbook treatment misses an important aspect of earnings dilution. EPS dilution is a big concern among regulated companies (3.60), even though in many cases the regulatory process ensures that utilities earn their required cost of capital, implying that EPS dilution should not affect share price. Concern about EPS dilution is strong among large (3.12), dividend-paying firms (3.06). EPS dilution is less important when the CEO has an MBA (2.62) than when he or she does not (2.95), perhaps because the executive has read Brealey and Myers!

Low cost or low risk: We inquire whether common stock is a firm's least risky or cheapest source of funds. (Williamson (1988) argues that equity is a cheap source of funds with which to finance low-specificity assets.) A modest number of the executives state that they use equity because it is the least risky source of funds (rating of 1.76 in Table 8). The idea that equity is low risk is more popular among firms with the characteristics of a new or start-up firm: small (1.93) with growth options (2.07). The idea that common stock is the cheapest source of funds is less popular (rating of 1.10), although firms with start-up characteristics are more likely to have this belief. Unreported analysis indicates that there is a positive correlation between believing that equity is the cheapest and that it is the least risky source of funds.

Miscellaneous: Nine companies indicate that they issue common stock because it is the "preferred currency" for making acquisitions, especially for the pooling method of accounting (see B.9 in Internet Appendix B). Two firms write that they issue stock because it is the natural form of financing for them in their current stage of corporate development.

5.8.c Convertible debt

We ask the executives whether the ability to call or force conversion is an important feature affecting convertible debt policy. Among the one-in-five firms that seriously considered issuing

[14] Conversely, if funds are obtained by issuing debt, the number of shares remains constant and so EPS may increase. However, the equity is levered and therefore more risky, so Modigliani and Miller's "conservation of value" tells us that the stock price will not increase due to higher EPS.

[15] If we consider public firms only, the mean response is 3.18. We consider any firm that seriously considered issuing common equity, rather than just public firms, to get a full representation of factors that discourage, as well as encourage, stock issuance.

convertible debt, there is moderate evidence that executives like convertibles because of the ability to call or force conversion (rating of 2.29 in Table 10).

Billingsley et al. (1985) document that convertibles cost on average 50 basis points less than straight debt. However, relatively few CFOs indicate that they use convertible debt because it is less expensive than straight debt (rating of 1.85). Companies run by mature executives are more likely to issue convertibles because they are less costly than straight debt (2.50).

Other survey evidence: Billingsley and Smith (1996) also find that convertibles are favored as delayed equity and because management feels that common equity is undervalued. Contrary to our results, Billingsley and Smith find fairly strong evidence that firms are influenced by the convertible use of other firms in their industry. They find that the most important factor affecting the use of convertibles is the lower cash costs/coupon rate versus straight debt. One difference between our study and Billingsley and Smith is that they request a response relative to a specific offering among firms that actually issue convertible debt. We condition only on whether a firm seriously considered issuing convertibles.

5.8.d Foreign debt

Grinblatt and Titman (1998) note that capital markets have become increasingly global in recent decades and that U.S. firms frequently raise funds overseas. We indicate above that firms issue foreign debt in response to tax incentives, to keep the source close to the use of funds, and in an attempt to take advantage of low foreign interest rates. Five firms write that they borrow overseas to broaden their sources of financing (see B.8 in Internet Appendix B). Few firms indicate that foreign regulations require them to issue abroad (rating of 0.61 in Table 7).

5.9. Summary of capital structure results

We find moderate support for the trade-off and pecking-order theories of capital structure choice. The support weakens as we probe more deeply into the assumptions and implications of the theories. We find mixed or little evidence that signaling, transactions costs, underinvestment costs, asset substitution, corporate control, bargaining with employees, free cash flow considerations, and product market concerns affect capital structure choice.

According to our survey, the most important factors affecting capital structure decisions are credit ratings, EPS dilution, the desire for financial flexibility, recent changes in stock price, maturity matching, hedging foreign operations, and practical cash management. Table 12 summarizes the capital structure findings.

[Insert Table 12]

6. Conclusions

Our survey of the practice of corporate finance is both reassuring and puzzling. For example, it is reassuring that NPV is dramatically more important now as a project evaluation method than, as indicated in past surveys, it was ten or twenty years ago. The CAPM is also widely used. However, it is surprising that more than half of the respondents would use their firm's overall discount rate to evaluate a project in an overseas market, even though the project likely has different risk attributes than the overall firm. This indicates that practitioners might not apply the CAPM correctly. It is also interesting that CFOs pay very little attention to risk factors based on momentum and book-to-market-value.

We identify fundamental differences between small and large firms. Our research suggests that small firms are less sophisticated when it comes to evaluating risky projects. Small firms are significantly less likely to use the NPV criterion or the Capital Asset Pricing Model and its variants. Perhaps these and our other findings about the effect of firm size will help academics understand the pervasive relation between size and corporate practices. Further, the fact that the practice of corporate finance differs based on firm size could be an underlying cause of size-related asset pricing anomalies.

In our analysis of capital structure, we find that informal criteria such as financial flexibility and credit ratings are the most important debt policy factors. Other informal criteria such as EPS dilution and recent stock price appreciation are the most important factors influencing equity issuance. The degree of stock undervaluation is also important to equity issuance, and we know from other surveys that most executives feel their stock is undervalued.

We find moderate support that firms follow the trade-off theory and target their debt ratio. Other results, such are the importance of equity undervaluation and financial flexibility, are generally consistent with the pecking-order view. However, the evidence in favor of these theories does not hold up as well under closer scrutiny (e.g., the evidence is generally not consistent with informational asymmetry causing pecking-order-like behavior), and is weaker still for more subtle theories.

In summary, executives use the mainline techniques that business schools have taught for years, NPV and CAPM, to value projects and to estimate the cost of equity. Interestingly, financial executives are much less likely to follow the academically proscribed factors and theories when determining capital structure. This last finding raises possibilities that require additional thought and research. Perhaps the relatively weak support for many capital structure theories indicates that it is time to critically reevaluate the assumptions and implications of these mainline theories. Alternatively, perhaps the theories are valid descriptions of what firms should do -- but many corporations ignore the theoretical advice. One explanation for this last possibility is that business schools might be better at teaching capital budgeting and the cost of capital than teaching capital structure. Moreover, perhaps the NPV and CAPM are more widely understood than capital structure theories because they make more precise predictions and have been accepted as mainstream views for longer. Additional research is needed to investigate these issues.

APPENDIX A. Nonresponse bias and other issues related to survey data

We perform several experiments to investigate whether nonresponse bias might affect our results. The first experiment, suggested by Wallace and Mellor (1988), compares the responses for firms that returned the survey on time (i.e., by February 23) to those that did not return the survey until February 24, 1999, or later. The firms that did not respond on time can be thought of as a sample from the non-response group, in the sense that they did not return the survey until we pestered them further. We first test, for each question, whether the mean response for the early respondents differs from the mean for the late respondents. There are 88 questions not related to firm characteristics. The mean answers for the early and late respondents are statistically different for only 8 (13) of these 88 questions at a 5% (10%) level.

Because the answers are correlated across different questions, we also perform multivariate χ^2 tests comparing the early and late responses. We calculate multivariate test statistics for each set of subquestions, grouped by main question. (That is, one χ^2 is calculated for the twelve subquestions related to the first question on the survey, another χ^2 for the six subquestions related to the second survey question, etc.) Out of the ten multivariate χ^2s comparing the means for the early and late responses, none (two) are significantly different at a 5% (10%) level.[16] Finally, a single multivariate χ^2 across all 88 subquestions does not detect significant differences between the early and late responses (p-value of 0.254). The rationale of Wallace and Mellor suggests that because the responses for these two groups of firms are similar, non-response bias is not a major problem.

The second set of experiments, suggested by Moore and Reichert (1983), investigates possible non-response bias by comparing characteristics of responding firms to characteristics for the population at large. If the characteristics between the two groups match, then the sample can be thought of as representing the population. This task is somewhat challenging because we have only limited information about the FEI population of firms. (Given that most Fortune 500 firms are also in the FEI population, we focus on FEI characteristics. We ignore any differences in population characteristics that may be attributable to the 187 firms that are in the Fortune 500 but not in FEI.) We have reliable information on three characteristics for the population of firms that belong to FEI: general industry classification, public versus private ownership, and number of employees.

We first use χ^2 goodness-of-fit analysis to determine whether the responses represent the industry groupings in roughly the same proportion as that found in the FEI population. Sixty-three percent of FEI members are from heavy manufacturing industries (manufacturing, energy, and transportation), as are 62% of the respondents. These percentages are not significantly different at the 5% level. Therefore, the heavy manufacturing vs. non-manufacturing breakdown that we use in most of our analysis is representative of the FEI population. We also examine public versus private ownership. Sixty percent of FEI firms are publicly owned, as are 64% of the sample firms. Again, these numbers are not statistically different, suggesting that our

[16] Following the order of the tables as they appear in the text, the multivariate analysis of variance p-values for each of the ten questions are 0.209, 0.063, 0.085, 0.892, 0.124, 0.705, 0.335, 0.922, 0.259 and 0.282. A low p-value indicates significant differences between the early and late responses.

numbers represent the FEI population, and also that our public versus private analysis is appropriate.

Although we do not have reliable information about the dividend policies, P/E ratios, sales revenue, or debt ratios for the FEI population, our analysis relies heavily on these variables, so we perform Monte Carlo simulations to determine the representativeness of our sample. Specifically, we take a random sample of 392 firms from the Compustat database, stratifying on the number of employees in FEI firms. That is, we sample from Compustat so that 15.4% of the draws are from firms with at least 20,000 employees, 24.7% are from firms with between 5,000 and 19,999 employees, etc., because these are the percentages for the FEI population. We then calculate the mean debt ratio, sales revenue, and P/E ratio (ignoring firms with negative earnings), and the percentage of firms that pay dividends for the randomly drawn firms. We repeat this process 1,000 times to determine an empirical distribution of mean values for each variable. We then compare the mean values for our sample to the empirical distribution. If, for example, the mean debt ratio for the responding firms is larger than 950 of the mean debt ratios in the Monte Carlo simulation, one would conclude that there is statistical evidence that respondent firms are more highly levered than are firms in the overall population.

The sample values for sales revenue and debt ratios fall comfortably near the middle of the empirical distributions, indicating that the sample is representative for these two characteristics. The mean P/E ratio of 17 for the sample is statistically smaller than the mean for the Compustat sample (overall mean of approximately 20). Fifty-four percent of the sample firms pay dividends, compared to approximately 45% in the stratified Compustat sample.[17] Although the sample and population differ statistically for these last two traits, the economic differences are small enough to indicate that our sample is representative of the population from which it is drawn.

Finally, given that much corporate finance research analyzes Compustat firms, we repeat the Monte Carlo experiment without stratifying by number of employees. That is, we randomly draw 392 firms (1000 times) from Compustat without conditioning on the number of employees. This experiment tells us whether our sample firms adequately represent Compustat firms, to provide an indication of how directly our survey results can be compared to Compustat-based research. The mean debt ratio, sales revenue, and P/E ratios are not statistically different from the means in the Compustat data; however, the percentage of firms paying dividends is smaller than for the overall Compustat sample. Aside from dividend payout, the firms that responded to our survey are similar to Compustat firms.

If one accepts that nonresponse bias is small, there are still concerns about survey data. For one thing, the respondents might not answer truthfully. Given that the survey is anonymous, we feel this problem is minimal. Moreover, our assessment from the phone conversations is that the executives would not take the time to fill out a survey if their intent was to be untruthful.

Another potential problem with survey data is that the questions, no matter how carefully crafted, either might not be properly understood or may not elicit the appropriate information.

[17] There are at least three reasons why our Monte Carlo experiment might indicate statistical differences, even if our sample firms are actually representative of the FEI population: 1) systematic differences between the Compustat and FEI populations not controlled for with the stratification based on number of employees, 2) the stratification is based on FEI firms only, although the survey "oversamples" Fortune 500 firms, and 3) we deleted firms with negative P/E ratios in the Monte Carlo simulations, although survey respondents might have entered zero or something else if they had negative earnings.

For example, Stigler (1966) asks managers if their firms maximize profits. The general response is that, no, they take care of their employees, are responsible corporate citizens, etc. However, when Stigler asks whether the firms could increase profits by increasing or decreasing prices, the answer is again no. Observations such as these can be used to argue that there is some sort of "economic Darwinism," in which the firms that survive must be doing the proper things, even if unintentionally. Or, as Milton Friedman (1953) notes, a good pool player has the skill to knock the billiards balls into one another just right, even if he or she can not solve a differential equation. Finally, Cliff Smith tells about a chef who, after tasting the unfinished product, always knew exactly which ingredient to add to perfect the day's recipe, but could never write down the proper list of ingredients after the meal was complete. These examples suggest that managers might use the proper techniques, or at least take the correct actions, even if their answers to a survey do not indicate so. If other firms copy the actions of successful firms, then it is possible that many firms take appropriate actions without thinking within the box of an academic model.

This set of critiques is impossible to completely refute. We attempted to be very careful when designing the questions on the survey. We also feel that by contrasting the answers conditional on firm characteristics, we should be able to detect patterns in the responses that shed light on the importance of different theories, even if the questions are not perfect in every dimension. Ultimately, however, the analysis we perform and conclusions we reach must be interpreted keeping in mind that our data are from a survey. Having said this, we feel that these data are representative and provide much unique information that complements what we can learn from traditional large sample analysis and clinical studies.

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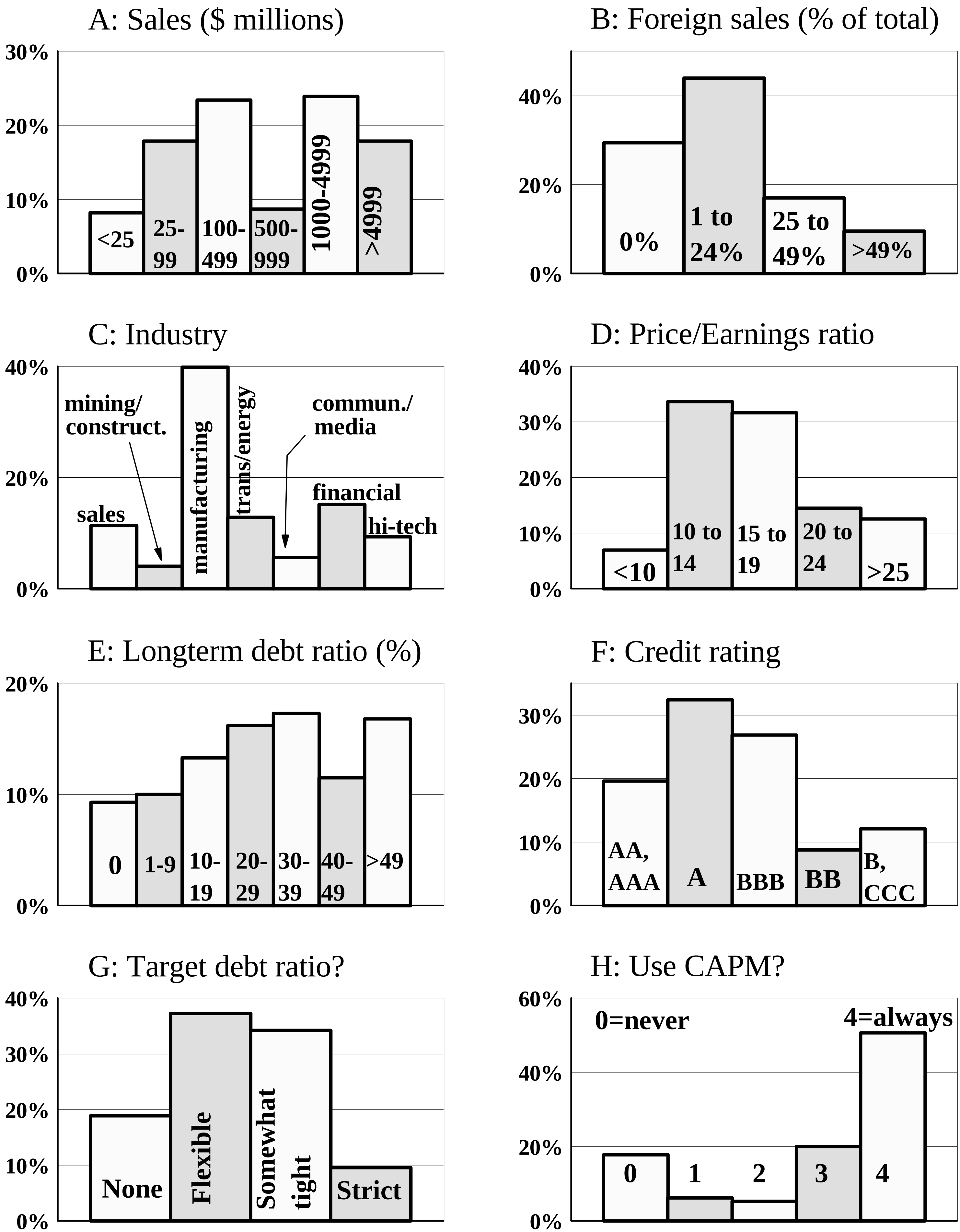

Figure 1: Sample Characterstics

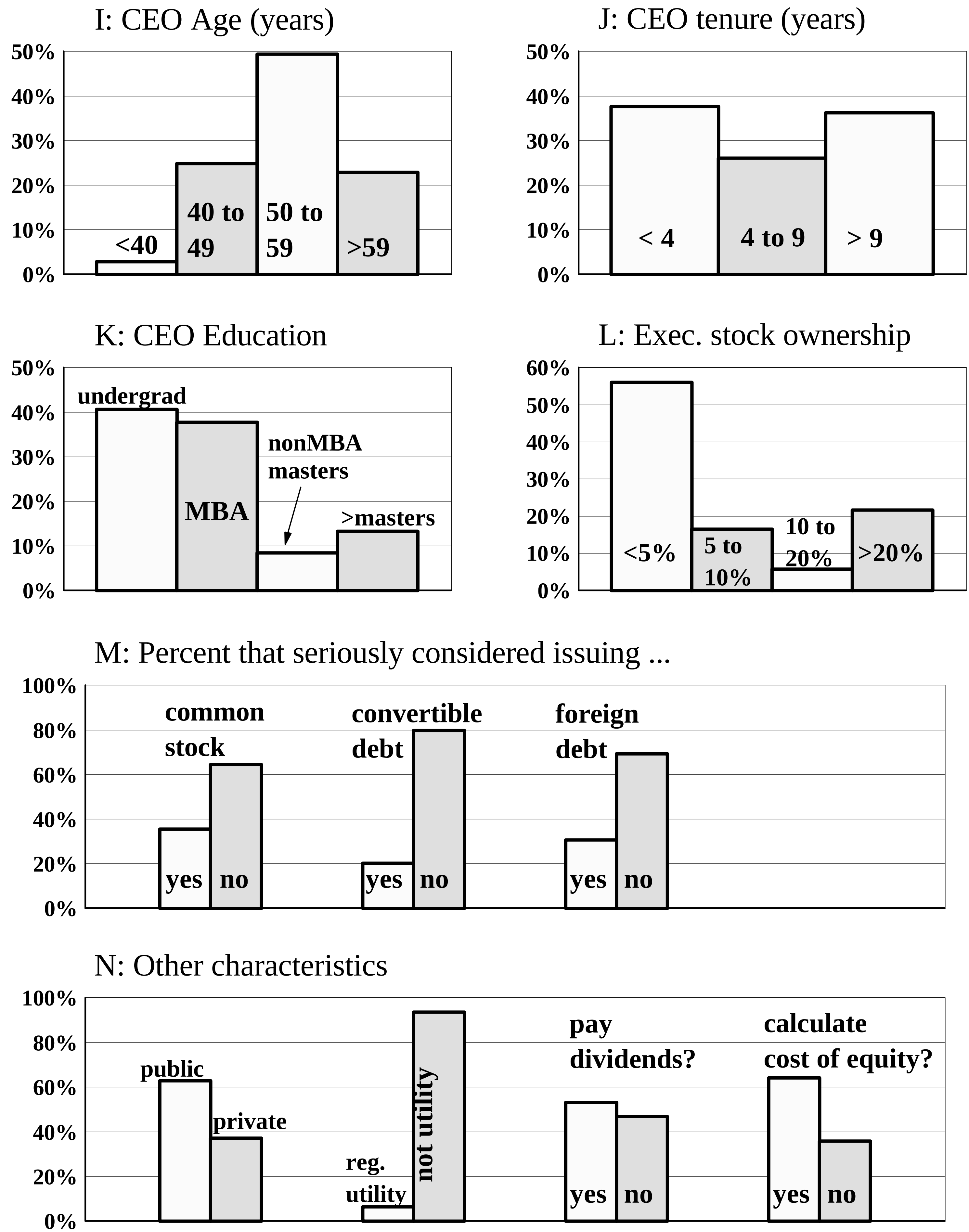

Figure 1, continued: Sample Characterstics

Table 1
Demographic correlations of control variables*

	Size (small to large)	P/E (low to high)	D/E (low to high)	Dividends (yes to no)	Rating (high to low)	Industry (manu. to others)	Ownership (high to low)	Age (young to mature)	Tenure (short to long)	Education (MBA to others)	Regulated (yes to no)	Target D/E (no to yes)	Equity (public to private	For. Rev (high to low)
P/E	0.199***													
D/E	0.113**	-0.032												
Dividends	-0.401***	-0.128*	-0.066											
Rating	-0.249***	-0.291***	0.303***	0.333***										
Industry	0.004	0.258***	-0.259***	0.220	-0.077									
Ownership	-0.432***	-0.194***	0.077	0.315***	0.296***	0.028								
Age	-0.040	-0.082	0.092	0.055	0.064	0.180***	-0.066							
Tenure	0.150***	-0.055	-0.036	-0.001	0.007	0.033	-0.256***	0.259***						
Education	-0.083	-0.006	-0.096*	-0.014	0.024	-0.061	0.111*	-0.152***	-0.133**					
Regulated	-0.191***	0.066	-0.095*	0.181***	0.147*	0.136**	0.141**	-0.076	-0.114**	-0.095*				
Target D/E	0.190***	-0.030	0.145***	-0.189***	-0.250***	-0.093*	-0.075	0.053	0.072	-0.033	-0.116**			
Equity	-0.422***	-0.114*	-0.111**	0.307***	-0.083	0.079	0.304***	0.075	-0.099*	0.076	0.169***	-0.009		
Foreign Rev.	-0.238***	-0.071	-0.013	0.150***	0.038	0.176***	0.151***	0.038	-0.129***	0.061	-0.126**	-0.092*	0.255***	
Fortune 500	0.497***	0.144**	0.026	-0.260***	-0.158**	0.049	-0.255***	-0.020	0.036	-0.058	-0.257***	0.210***	-0.323***	-0.039

*Index of mean square contingency or ϕ is reported. This statistic measures the correlation of ordered groups of attributes. Cross tabulations are conducted by size (large firms have sales of at least $1 billion), growth (growth has P/E ratio greater than 14), leverage (high has debt equity greater than .3), investment grade (yes has debt rated BBB or above), whether firm pays dividends, industry (manufacturing/energy/transportation versus all others), amount of management ownership (high is greater than 5%), age (older than 59 versus younger than 60), CEO tenure (long is 9 or more years on the job), whether the CEO has an MBA, whether firms are regulated, whether firm reports a target debt ratio, public versus private corporations, whether foreign sales are greater than 25%, and whether the survey was from the mailing to the Fortune 500 firms rather than the fax to a broader group of firms.

***, **, * denotes a significant difference at the 1%, 5% and 10% level, respectively.

Table 2

How frequently does your firm use the following techniques when deciding which projects or acquisitions to pursue?[a]

	%always or almost always	Mean	Size		P/E		Leverage		Investment grade		Pay dividends		Industry		Management own.	
			Small	Large	Growth	Non-G	Low	High	Yes	No	Yes	No	Manu.	Others	Low	High
b) Internal Rate of Return	75.61	3.09	2.87	3.41 ***	3.36	3.36 .	2.85	3.36 ***	3.52	3.35 .	3.43	2.68 ***	3.19	2.94 **	3.34	2.85 ***
a) Net Present Value	74.93	3.08	2.83	3.42 ***	3.30	3.27 .	2.84	3.39 ***	3.47	3.38 .	3.35	2.76 ***	3.23	2.82 ***	3.35	2.77 ***
f) Payback period	56.74	2.53	2.72	2.25 ***	2.55	2.41 .	2.58	2.46 .	2.48	2.36 .	2.46	2.63 .	2.68	2.33 ***	2.39	2.70 **
c) Hurdle Rate	56.94	2.48	2.13	2.95 ***	2.78	2.87 .	2.27	2.63 **	3.01	2.92 .	2.84	2.06 ***	2.60	2.29 **	2.70	2.12 ***
j) Sensitivity analysis (e.g., "good" vs. "fair" vs. "bad")	51.54	2.31	2.13	2.56 ***	2.35	2.41 .	2.10	2.56 ***	2.60	2.62 .	2.42	2.17 **	2.35	2.24 .	2.37	2.18 .
d) Earnings multiple approach	38.92	1.89	1.79	2.01 *	1.97	2.11 .	1.67	2.12 ***	1.90	2.22 *	1.88	1.88 .	1.85	2.00 .	1.85	2.04 .
g) Discounted payback period	29.45	1.56	1.58	1.55 .	1.52	1.67 .	1.49	1.64 .	1.84	1.49 *	1.54	1.62 .	1.61	1.50 .	1.49	1.76 *
l) We incorporate the "real options" of a project when evaluating it	26.59	1.47	1.40	1.57 .	1.31	1.55 .	1.50	1.41 .	1.34	1.61 .	1.37	1.52 .	1.49	1.45 .	1.40	1.52 .
i) Accounting Rate of Return (or Book Rate of Return on Assets)	20.29	1.34	1.41	1.25 .	1.43	1.19 .	1.34	1.32 .	1.22	1.21 .	1.40	1.27 .	1.36	1.34 .	1.30	1.44 .
k) Value-at-Risk or other simulation analysis	13.66	0.95	0.76	1.22 ***	0.84	0.86 .	0.78	1.10 ***	1.09	1.04 .	1.04	0.82 **	0.95	0.92 .	0.95	0.86 .
e) Adjusted Present Value	10.78	0.85	0.93	0.72 **	0.97	0.69 **	0.87	0.80 .	0.80	0.79 .	0.80	0.91 .	0.78	0.92 .	0.79	0.99 *
h) Profitability index	11.87	0.83	0.88	0.75 .	0.73	0.81 .	0.74	0.96 *	0.66	0.67 .	0.81	0.83 .	0.90	0.76 .	0.81	0.98 .

	%always or almost always	Mean	CEO age		CEO tenure		CEO MBA		Regulated		Target debt ratio		Public corp.		Foreign sales		Fortune 500 mail	
			>59	Ynger	Long	Short	Yes	No	Yes	No	No	Yes	Yes	No	Yes	No	No	Yes
b) Internal Rate of Return	75.61	3.09	3.21	3.06 .	2.97	3.16 *	3.17	3.03 .	3.76	3.04 ***	3.03	3.18 .	3.27	2.77 ***	3.31	3.01 **	3.00	3.57 ***
a) Net Present Value	74.93	3.08	3.08	3.09 .	2.90	3.17 **	3.17	3.00 *	3.50	3.07 **	2.99	3.23 **	3.24	2.78 ***	3.38	2.95 ***	2.97	3.60 ***
f) Payback period	56.74	2.53	2.83	2.43 ***	2.80	2.37 ***	2.48	2.55 .	2.05	2.56 **	2.65	2.43 *	2.45	2.67 *	2.62	2.49 .	2.57	2.35 .
c) Hurdle Rate	56.94	2.48	2.88	2.38 ***	2.39	2.51 .	2.57	2.42 .	3.18	2.42 **	2.33	2.64 **	2.70	2.10 ***	2.56	2.43 .	2.30	3.28 ***
j) Sensitivity analysis (e.g., "good" vs. "fair" vs. "bad")	51.54	2.31	2.20	2.36 .	2.20	2.37 .	2.41	2.25 .	3.14	2.26 ***	2.24	2.43 .	2.37	2.18 .	2.36	2.28 .	2.22	2.76 ***
d) Earnings multiple approach	38.92	1.89	2.25	1.79 **	1.93	1.86 .	1.98	1.86 .	1.62	1.90 .	1.85	1.96 .	2.08	1.56 ***	1.98	1.84 .	1.83	2.15 *
g) Discounted payback period	29.45	1.56	1.94	1.48 ***	1.72	1.46 *	1.68	1.49 .	1.52	1.60 .	1.57	1.61 .	1.56	1.60 .	1.62	1.53 .	1.51	1.84 *
l) We incorporate the "real options" of a project when evaluating it	26.59	1.47	1.68	1.40 *	1.56	1.36 .	1.49	1.39 .	0.95	1.48 *	1.44	1.46 .	1.40	1.59 .	1.53	1.43 .	1.44	1.57 .
i) Accounting Rate of Return (or Book Rate of Return on Assets)	20.29	1.34	1.49	1.33 .	1.39	1.34 .	1.42	1.29 .	1.76	1.30 *	1.30	1.39 .	1.31	1.43 .	1.27	1.38 .	1.36	1.26 .
k) Value-at-Risk or other simulation analysis	13.66	0.95	1.07	0.90 .	0.92	0.93 .	0.99	0.88 .	1.76	0.89 ***	0.77	1.12 ***	0.89	1.01 .	0.90	0.96 .	0.86	1.36 ***
e) Adjusted Present Value	10.78	0.85	1.18	0.75 ***	0.88	0.80 .	0.74	0.91 *	0.67	0.86 .	0.88	0.81 .	0.83	0.90 .	0.74	0.89 .	0.86	0.80 .
h) Profitability index	11.87	0.83	0.87	0.83 .	0.95	0.77 *	0.83	0.85 .	0.57	0.85 .	0.75	0.99 **	0.76	1.00 **	0.81	0.83 .	0.85	0.75 .

[a] Respondents are asked to rate on a scale of 0 (never) to 4 (always). We report the overall mean as well as the % of respondents that answered 3 (almost always) or 4 (always).

***, **, * denotes a significant difference at the 1%, 5% and 10% level, respectively. All table columns are defined in Table 1.

Table 3

Does your firm estimate the cost of equity capital? (if "no", please go to next question). If "yes", how do you determine your firm's cost of equity capital?[a]

	%always or almost always	Mean	Size		P/E		Leverage		Investment grade		Pay dividends		Industry		Management own.	
			Small	Large	Growth	Non-G	Low	High	Yes	No	Yes	No	Manu.	Others	Low	High
b) using the Capital Asset Pricing Model (CAPM, the "beta" approach)	73.49	2.92	2.49	3.27 ***	3.19	3.03 .	2.57	3.23 ***	3.13	3.34 .	3.00	2.76 .	3.02	2.87 .	3.26	2.36 ***
a) with average historical returns on common stock	39.41	1.72	1.80	1.65 .	1.65	1.78 .	1.80	1.56 .	1.67	1.48 .	1.77	1.63 .	1.60	1.84 .	1.66	1.87 .
c) using the CAPM but including some extra "risk factors"	34.29	1.56	1.39	1.70 *	1.62	1.48 .	1.57	1.45 .	1.71	1.76 .	1.51	1.54 .	1.69	1.49 .	1.59	1.44 .
f) back out from discounted dividend/earnings model, e.g.,Price=Div./(cost of cap. – growth)	15.74	0.91	0.96	0.87 .	0.90	1.02 .	0.72	1.05 **	0.92	0.98 .	0.90	0.95 .	0.98	0.80 .	0.97	1.10 .
d) whatever our investors tell us they require	13.93	0.86	1.22	0.54 ***	0.76	0.44 **	0.92	0.88 .	0.48	0.79 *	0.70	1.12 **	0.80	0.97 .	0.65	1.23 ***
e) by regulatory decisions	7.04	0.44	0.37	0.50 .	0.56	0.32 *	0.48	0.36 .	0.51	0.44 .	0.54	0.24 **	0.44	0.44 .	0.51	0.41 .

	%always or almost always	Mean	CEO age		CEO tenure		CEO MBA		Regulated		Target debt ratio		Public corp.		Foreign sales		Fortune 500 mail	
			>59	Ynger	Long	Short	Yes	No	Yes	No	No	Yes	Yes	No	Yes	No	No	Yes
b) using the Capital Asset Pricing Model (CAPM, the "beta" approach)	73.49	2.92	2.85	2.93 .	2.83	2.96 .	3.08	2.77 *	3.00	2.87 .	2.83	3.03 .	3.13	2.13 ***	3.23	2.75 **	2.78	3.46 ***
a) with average historical returns on common stock	39.41	1.72	2.43	1.54 ***	1.70	1.73 .	1.53	1.90 *	1.60	1.70 .	1.64	1.80 .	1.65	1.91 .	1.62	1.78 .	1.80	1.38 *
c) using the CAPM but including some extra "risk factors"	34.29	1.56	1.91	1.48 *	1.66	1.49 .	1.62	1.48 .	2.17	1.41 **	1.53	1.49 .	1.56	1.53 .	1.57	1.52 .	1.38	2.17 ***
f) back out from discounted dividend/earnings model, e.g.,Price=Div./(cost of cap. – growth)	15.74	0.91	1.21	0.82 **	1.05	0.83 .	0.78	1.02 *	1.20	0.88 .	0.93	0.92 .	0.99	0.68 *	0.81	0.97 .	0.90	0.95 .
d) whatever our investors tell us they require	13.93	0.86	0.76	0.87 .	1.02	0.79 .	0.72	0.99 *	0.69	0.87 .	0.94	0.81 .	0.67	1.53 ***	0.65	0.97 **	0.96	0.46 **
e) by regulatory decisions	7.04	0.44	0.32	0.47 .	0.39	0.43 .	0.41	0.47 .	2.19	0.28 ***	0.49	0.43 .	0.49	0.27 *	0.20	0.55 ***	0.37	0.71 **

[a] Respondents are asked to rate on a scale of 0 (never) to 4 (always). We report the overall mean as well as the % of respondents that answered 3 (almost always) and 4 (always).

***, **, * denotes a significant difference at the 1%, 5% and 10% level, respectively. All table columns are defined in Table 1.

Table 4

When valuing a project, do you adjust either the discount rate or cash flows for the following risk factors? (Check the most appropriate box for each factor).

Percentage of respondents choosing each category is reported[a]

	Overall				Size							
					Discount rate		Cash Flow		Both		Neither	
	Disc. rate	Cash flow	Both	Neither	Small	Large	Small	Large	Small	Large	Small	Large
b) interest rate risk (change in general level of interest rates)	15.30	8.78	24.65	51.27	17.33	12.67	7.43	10.67	29.70	17.33	45.54	59.33 **
f) foreign exchange risk	10.80	15.34	18.75	55.11	7.43	15.44	9.90	22.82	15.35	23.49	67.33	38.26 ***
d) GDP or business cycle risk	6.84	18.80	18.80	55.56	6.93	6.76	12.87	27.03	19.80	17.57	60.40	48.65 **
a) risk of unexpected inflation	11.90	14.45	11.90	61.76	13.43	9.93	9.95	20.53	14.93	7.95	61.69	61.59 ·
h) size (small firms being riskier)	14.57	6.00	13.43	66.00	14.43	14.67	7.46	4.00	16.92	8.67	61.19	71.33 **
e) commodity price risk	2.86	18.86	10.86	67.43	2.49	3.38	12.94	27.03	9.45	12.84	75.12	56.76 ***
c) term structure risk (change in the long-term vs. short term interest rate)	8.57	3.71	12.57	75.14	10.45	6.08	2.99	4.73	14.93	9.46	71.64	79.73 *
g) distress risk (probability of bankruptcy)	7.41	6.27	4.84	81.48	5.94	9.40	4.95	8.05	6.93	2.01	82.18	79.87 ·
i) "market-to-book" ratio (ratio of market value of firm to book value of assets)	3.98	1.99	7.10	86.93	4.46	3.36	1.49	2.68	8.91	4.70	85.15	89.26 ·
j) momentum (recent stock price performance).	3.43	2.86	4.86	88.86	3.98	2.70	2.99	2.70	6.47	2.70	86.57	91.89 ·

	P/E							
	Discount rate		Cash Flow		Both		Neither	
	Growth	Non-G	Growth	Non-G	Growth	Non-G	Growth	Non-G
b) interest rate risk (change in general level of interest rates)	13.39	7.06	7.09	16.47	22.83	18.82	56.69	57.65 ·
f) foreign exchange risk	10.24	18.75	14.96	22.50	22.83	23.75	51.97	35.00 **
d) GDP or business cycle risk	6.98	7.41	24.03	18.52	22.48	14.81	46.51	59.26 *
a) risk of unexpected inflation	12.40	9.64	14.73	16.87	10.08	12.05	62.79	61.45 ·
h) size (small firms being riskier)	14.84	15.66	7.03	3.61	17.19	9.64	60.94	68.67 ·
e) commodity price risk	3.12	4.94	20.31	24.69	12.50	7.41	64.06	62.96 ·
c) term structure risk (change in the long-term vs. short term interest rate)	7.03	6.10	3.12	6.10	10.94	17.07	78.91	70.73 ·
g) distress risk (probability of bankruptcy)	6.98	15.85	6.98	6.10	6.98	n/a	79.07	76.83 ·
i) "market-to-book" ratio (ratio of market value of firm to book value of assets)	2.38	8.43	3.17	1.20	5.56	6.02	88.89	84.34 ·
j) momentum (recent stock price performance).	3.15	4.94	2.36	4.94	4.72	1.23	89.76	88.89 ·

	Leverage							
	Discount rate		Cash Flow		Both		Neither	
	Low	High	Low	High	Low	High	Low	High
b) interest rate risk (change in general level of interest rates)	14.29	18.12	10.71	6.52	24.40	23.19	50.60	52.17 ·
f) foreign exchange risk	12.88	7.09	12.88	18.44	17.18	21.99	57.06	52.48 ·
d) GDP or business cycle risk	6.83	4.96	13.66	28.37	16.15	24.82	63.35	41.84 ***
a) risk of unexpected inflation	13.94	10.71	10.91	16.43	8.48	13.57	66.67	59.29 ·
h) size (small firms being riskier)	10.37	15.60	6.71	5.67	17.68	9.93	65.24	68.09 ·
e) commodity price risk	1.24	4.32	14.29	26.62	12.42	8.63	72.05	60.43 **
c) term structure risk (change in the long-term vs. short term interest rate)	6.17	11.43	6.17	2.14	10.49	15.71	77.16	70.71 ·
g) distress risk (probability of bankruptcy)	4.82	8.45	6.63	6.34	4.82	4.23	83.73	80.99 ·
i) "market-to-book" ratio (ratio of market value of firm to book value of assets)	3.61	4.32	3.61	0.72	6.63	7.19	86.14	87.77 ·
j) momentum (recent stock price performance).	3.68	3.55	2.45	3.55	4.91	4.26	88.96	88.65 ·

Table 4 (continued)

When valuing a project, do you adjust either the discount rate or cash flows for the following risk factors? (Check the most appropriate box for each factor).

	Pay dividends								Industry							
	Discount rate		Cash Flow		Both		Neither		Discount rate		Cash Flow		Both		Neither	
	Yes	No	Yes	No	Yes	No	Yes	No	Man.	Other	Man.	Other	Man.	Other	Man.	Other
b) interest rate risk (change in general level of interest rates)	12.11	19.75	10.53	6.37	22.11	27.39	55.26	46.50	13.92	17.56	6.70	12.21	22.16	27.48	57.22	42.75 **
f) foreign exchange risk	14.89	6.37	16.49	14.01	20.21	16.56	48.40	63.06 ***	11.52	11.28	17.80	13.53	23.04	15.79	47.64	59.40 **
d) GDP or business cycle risk	5.91	8.23	25.27	10.76	18.28	19.62	50.54	61.39 **	5.18	9.85	23.83	12.88	20.21	17.42	50.78	59.85
a) risk of unexpected inflation	9.57	15.19	19.15	9.49	11.70	12.66	59.57	62.66	10.77	13.74	17.44	9.16	12.31	11.45	59.49	65.65
h) size (small firms being riskier)	15.59	13.29	6.45	5.70	10.75	16.46	66.67	63.92	12.50	17.29	6.25	6.02	13.02	14.29	68.23	60.90
e) commodity price risk	4.32	1.25	23.24	13.75	12.43	9.38	60.00	75.62 ***	2.09	3.79	26.18	11.36	13.09	9.09	58.64	75.76 ***
c) term structure risk (change in the long-term vs. short term interest rate)	6.45	11.46	3.76	3.18	12.37	12.74	77.42	72.61	5.73	11.54	3.12	5.38	9.90	16.15	81.25	66.92 ***
g) distress risk (probability of bankruptcy)	9.57	5.10	6.91	5.10	4.26	5.73	78.72	84.08	7.69	7.75	3.59	10.08	6.15	3.88	82.56	77.52
i) "market-to-book" ratio (ratio of market value of firm to book value of assets)	4.28	3.80	2.67	1.27	7.49	6.96	85.56	87.97	3.09	5.34	2.58	1.53	5.15	9.92	89.18	83.21
j) momentum (recent stock price performance).	3.23	3.82	4.30	1.27	3.76	6.37	88.71	88.54	1.55	6.15	2.59	3.08	2.59	7.69	93.26	83.08 ***

	Management ownership								CEO age							
	Discount rate		Cash Flow		Both		Neither		Discount rate		Cash Flow		Both		Neither	
	Low	High	Low	High	Low	High	Low	High	Mature	Young	Mature	Young	Mature	Young	Mature	Young
b) interest rate risk (change in general level of interest rates)	16.17	14.50	8.98	6.87	16.17	32.06	58.68	46.56 **	11.84	16.54	10.53	8.27	26.32	23.68	51.32	51.50
f) foreign exchange risk	15.98	5.47	18.34	10.94	20.71	19.53	44.97	64.06 ***	8.00	11.28	13.33	16.54	25.33	16.54	53.33	55.64
d) GDP or business cycle risk	9.52	3.91	23.81	14.84	15.48	23.44	51.19	57.81	9.46	6.02	17.57	19.55	18.92	19.55	54.05	54.89
a) risk of unexpected inflation	13.94	12.98	16.36	9.92	8.48	12.21	61.21	64.89	13.16	11.65	18.42	13.53	14.47	10.53	53.95	64.29
h) size (small firms being riskier)	17.26	11.54	4.17	10.00	7.74	19.23	70.24	58.46 **	14.29	15.15	5.19	5.68	16.88	12.50	63.64	65.91
e) commodity price risk	4.24	2.29	21.82	16.03	9.09	12.98	64.85	68.70	1.33	3.41	16.00	20.08	18.67	9.09	64.00	67.42
c) term structure risk (change in the long-term vs. short term interest rate)	6.67	11.45	3.03	4.58	13.33	11.45	76.97	72.52	1.35	10.90	5.41	3.38	10.81	12.41	82.43	73.31
g) distress risk (probability of bankruptcy)	8.98	6.92	6.59	6.92	3.59	6.15	80.24	80.00	10.39	6.44	1.30	7.95	2.60	5.30	85.71	79.92
i) "market-to-book" ratio (ratio of market value of firm to book value of assets)	5.39	3.08	2.40	1.54	4.79	8.46	87.43	86.92	6.58	3.40	n/a	2.64	9.21	6.42	84.21	87.55
j) momentum (recent stock price performance).	3.59	3.88	3.59	2.33	2.40	7.75	90.42	86.05	5.56	3.00	1.39	3.37	8.33	3.75	84.72	89.89

Table 4 (continued)

When valuing a project, do you adjust either the discount rate or cash flows for the following risk factors? (Check the most appropriate box for each factor).

	CEO tenure								CEO MBA							
	Discount rate		Cash Flow		Both		Neither		Discount rate		Cash Flow		Both		Neither	
	Long	Short	Long	Short	Long	Short	Long	Short	Yes	No	Yes	No	Yes	No	Yes	No
b) interest rate risk (change in general level of interest rates)	14.88	15.53	10.74	7.76	30.58	20.09	43.80	56.62 **	15.50	15.58	10.85	7.54	23.26	24.62	50.39	52.26
f) foreign exchange risk	13.22	8.72	9.92	19.27	19.01	18.35	57.85	53.67	12.60	9.45	20.47	11.94	20.47	16.92	46.46	61.69 ***
d) GDP or business cycle risk	5.83	7.31	21.67	18.26	19.17	18.72	53.33	55.71	7.94	6.44	19.05	18.32	21.43	19.31	51.59	55.94
a) risk of unexpected inflation	11.67	12.22	16.67	13.57	16.67	8.60	55.00	65.61 *	10.08	12.00	17.83	12.00	10.85	12.00	61.24	64.00
h) size (small firms being riskier)	14.88	15.14	6.61	5.05	13.22	13.30	65.29	65.60	17.19	12.38	6.25	5.45	14.06	12.87	62.50	68.32
e) commodity price risk	0.83	4.17	16.53	20.37	10.74	11.57	71.90	63.89	3.94	2.50	18.90	18.50	11.81	11.00	65.35	68.00
c) term structure risk (change in the long-term vs. short term interest rate)	7.56	9.59	2.52	4.57	10.92	12.33	78.99	73.52	11.72	7.50	3.12	4.00	13.28	11.00	71.88	77.50
g) distress risk (probability of bankruptcy)	10.00	5.94	8.33	5.48	3.33	5.48	78.33	82.65	8.59	6.47	6.25	6.47	3.91	5.47	81.25	81.09
i) "market-to-book" ratio (ratio of market value of firm to book value of assets)	2.48	5.05	1.65	2.29	6.61	7.34	89.26	85.32	5.56	3.45	0.79	2.46	4.76	7.88	88.89	86.21
j) momentum (recent stock price performance).	1.69	4.57	0.85	4.11	4.24	5.02	93.22	86.30 *	3.97	2.99	0.79	4.48	6.35	3.48	88.89	89.05

	Regulated								Target debt ratio							
	Discount rate		Cash Flow		Both		Neither		Discount rate		Cash Flow		Both		Neither	
	Yes	No	Yes	No	Yes	No	Yes	No	No	Yes	No	Yes	No	Yes	No	Yes
b) interest rate risk (change in general level of interest rates)	14.29	16.12	9.52	8.22	23.81	23.03	52.38	52.63	17.84	11.64	7.57	8.22	23.78	27.40	50.81	52.74
f) foreign exchange risk	9.52	11.84	9.52	15.13	14.29	19.08	66.67	53.95	12.90	7.69	14.52	16.78	17.20	20.28	55.38	55.24
d) GDP or business cycle risk	4.76	7.26	9.52	18.48	14.29	18.48	71.43	55.78	8.56	3.55	20.32	17.73	18.72	17.02	52.41	61.70 *
a) risk of unexpected inflation	4.76	13.20	38.10	12.87	4.76	11.88	52.38	62.05	14.52	6.90	12.90	15.86	8.60	15.86	63.98	61.38
h) size (small firms being riskier)	20.00	14.80	5.00	5.26	n/a	14.14	75.00	65.13	14.89	13.29	6.38	5.59	13.83	13.99	64.36	66.43
e) commodity price risk	4.76	2.95	42.86	17.05	9.52	9.84	42.86	70.16 ***	2.17	4.17	20.11	18.06	10.33	11.81	67.39	65.97
c) term structure risk (change in the long-term vs. short term interest rate)	4.76	9.24	9.52	2.64	9.52	12.54	76.19	75.58	11.70	4.90	3.72	3.50	9.57	16.08	75.00	75.52
g) distress risk (probability of bankruptcy)	5.00	7.57	n/a	6.25	n/a	5.26	95.00	80.59	5.85	9.86	6.38	7.04	5.32	4.23	82.45	78.17
i) "market-to-book" ratio (ratio of market value of firm to book value of assets)	n/a	3.93	4.76	1.64	n/a	7.21	95.24	87.21	4.23	4.26	1.06	3.55	5.29	8.51	89.42	83.69
j) momentum (recent stock price performance).	n/a	3.62	4.76	2.63	4.76	4.61	90.48	89.14	3.23	4.23	2.69	3.52	3.76	5.63	90.32	86.62

Table 4 (continued)

When valuing a project, do you adjust either the discount rate or cash flows for the following risk factors? (Check the most appropriate box for each factor).

	Public corporation								Foreign sales							
	Discount rate		Cash Flow		Both		Neither		Discount rate		Cash Flow		Both		Neither	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
b) interest rate risk (change in general level of interest rates)	11.84	21.01	10.09	5.88	21.49	31.09	56.58	42.02 ***	13.54	15.94	8.33	8.76	19.79	26.29	58.33	49.00 ·
f) foreign exchange risk	13.00	7.32	18.39	10.57	23.32	11.38	45.29	70.73 ***	13.83	9.52	22.34	12.30	31.91	13.49	31.91	64.68 ***
d) GDP or business cycle risk	7.11	6.61	21.78	13.22	19.56	17.36	51.56	62.81 **	6.45	7.14	26.88	15.87	16.13	19.44	50.54	57.54 ·
a) risk of unexpected inflation	12.78	10.83	15.42	10.83	9.69	15.83	62.11	62.50 ·	7.29	13.55	19.79	12.75	13.54	11.55	59.38	62.15 ·
h) size (small firms being riskier)	14.60	14.17	5.75	6.67	11.50	17.50	67.26	61.67 ·	12.77	15.02	7.45	5.53	11.70	14.23	68.09	64.43 ·
e) commodity price risk	3.59	1.64	22.87	11.48	10.31	10.66	63.23	76.23 **	3.23	2.79	26.88	15.14	10.75	10.76	59.14	71.31 **
c) term structure risk (change in the long-term vs. short term interest rate)	7.56	10.08	4.89	1.68	11.56	15.13	76.00	73.11 ·	6.45	9.52	4.30	3.57	13.98	12.30	75.27	74.60 ·
g) distress risk (probability of bankruptcy)	9.73	3.33	7.52	4.17	3.98	6.67	78.32	85.83 ·	9.38	6.75	7.29	5.95	2.08	5.95	81.25	80.95 ·
i) "market-to-book" ratio (ratio of market value of firm to book value of assets)	5.33	1.65	2.67	0.83	4.44	12.40	87.56	85.12 ·	4.26	3.95	5.32	0.79	5.32	7.91	85.11	87.35 ·
j) momentum (recent stock price performance).	4.48	1.65	2.69	3.31	2.69	9.09	90.13	85.95 ·	4.26	3.19	3.19	2.79	4.26	5.18	88.30	88.84 ·

	Fortune 500 (using smaller sample)							
	Discount rate		Cash Flow		Both		Neither	
	No	Yes	No	Yes	No	Yes	No	Yes
b) interest rate risk (change in general level of interest rates)	16.60	9.50	8.30	11.10	25.50	20.60	49.70	58.70
f) foreign exchange risk	9.30	17.50	13.80	22.20	17.30	25.40	59.50	34.90 ***
d) GDP or business cycle risk	6.80	6.80	16.80	28.80	20.50	10.20	55.80	54.20
a) risk of unexpected inflation	12.70	8.20	12.30	24.60	11.60	13.10	63.40	54.10
h) size (small firms being riskier)	13.40	19.70	6.50	3.30	15.80	1.60	64.30	72.10 *
e) commodity price risk	2.80	3.30	15.60	34.40	10.70	11.50	70.90	50.80 ***
c) term structure risk (change in the long-term vs. short term interest rate)	8.70	8.20	3.50	4.90	12.80	11.50	75.10	75.40
g) distress risk (probability of bankruptcy)	6.10	13.60	6.10	6.80	5.80		81.90	78.00 *
i) "market-to-book" ratio (ratio of market value of firm to book value of assets)	4.10	3.20	1.40	4.80	8.30	1.60	86.20	90.30
j) momentum (recent stock price performance).	3.10	5.00	2.40	5.00	5.50	1.70	89.00	88.30

[a] Percentage of respondents choosing each category is reported. The percentages for discount rate, cash flow, both and neither should sum to 100.

***, **, * denotes a significant difference at the 1%, 5% and 10% level, respectively. All table columns are defined in Table 1.

Table 5

How frequently would your company use the following discount rates when evaluating a new project in an overseas market? To evaluate this project we would use[a]…

	%always or almost always	Mean	Size		P/E		Leverage		Investment grade		Pay dividends		Industry		Management own.	
			Small	Large	Growth	Non-G	Low	High	Yes	No	Yes	No	Manu.	Others	Low	High
a) The discount rate for our entire company	58.79	2.50	2.50	2.50 .	2.76	2.37 **	2.45	2.58 .	2.41	2.83 **	2.46	2.53 .	2.56	2.32 *	2.61	2.41 .
d) A risk matched discount rate for this particular project (considering both country and industry)	50.95	2.09	1.86	2.36 ***	2.20	2.26 .	1.99	2.30 **	2.43	2.25 .	2.31	1.82 ***	2.22	2.01 .	2.22	2.01 .
b) The discount rate for the overseas market (country discount rate)	34.52	1.65	1.49	1.82 **	1.84	1.69 .	1.54	1.81 *	1.82	2.01 .	1.75	1.52 *	1.86	1.42 ***	1.70	1.52 .
c) A divisional discount rate (if the project line of business matches a domestic division)	15.61	0.95	0.82	1.09 **	1.12	1.04 .	0.88	1.08 *	1.17	1.05 .	1.05	0.84 *	1.01	0.90 .	0.96	1.08 .
e) A different discount rate for each component cashflow that has a different risk characteristic (e.g. depreciation vs. operating cash flows)	9.87	0.66	0.68	0.64 .	0.49	0.85 ***	0.61	0.68 .	0.75	0.58 .	0.68	0.64 .	0.68	0.65 .	0.56	0.85 **

	%always or almost always	Mean	CEO age		CEO tenure		CEO MBA		Regulated		Target debt ratio		Public corp.		Foreign sales		Fortune 500 mail	
			>59	Ynger	Long	Short	Yes	No	Yes	No	No	Yes	Yes	No	Yes	No	No	Yes
a) The discount rate for our entire company	58.79	2.50	2.54	2.49 .	2.18	2.64 ***	2.49	2.51 .	2.00	2.52 *	2.39	2.64 *	2.55	2.42 .	2.87	2.33 ***	2.57	2.20 **
d) A risk matched discount rate for this particular project (considering both country and industry)	50.95	2.09	2.31	2.02 *	2.11	2.06 .	2.20	1.99 .	2.55	2.03 *	1.90	2.25 **	2.24	1.79 ***	2.21	2.02 .	1.97	2.61 ***
b) The discount rate for the overseas market (country discount rate)	34.52	1.65	1.80	1.61 .	1.49	1.73 *	1.77	1.60 .	1.50	1.66 .	1.70	1.58 .	1.78	1.41 **	1.81	1.58 .	1.58	1.92 *
c) A divisional discount rate (if the project line of business matches a domestic division)	15.61	0.95	1.18	0.87 **	0.99	0.92 .	0.88	0.98 .	1.27	0.89 *	0.91	1.01 .	1.08	0.66 ***	0.94	0.93 .	0.89	1.17 *
e) A different discount rate for each component cashflow that has a different risk characteristic (e.g. depreciation vs. operating cash flows)	9.87	0.66	0.72	0.62 .	0.55	0.68 .	0.59	0.67 .	0.38	0.67 .	0.67	0.57 .	0.61	0.79 *	0.63	0.68 .	0.71	0.46 *

[a] Respondents are asked to rate on a scale of 0 (never) to 4 (always). We report the overall mean as well as the % of respondents that answered 3 (almost always) and 4 (always).

***, **, * denotes a significant difference at the 1%, 5% and 10% level, respectively. All table columns are defined in Table 1.

Table 6

What factors affect how you choose the appropriate amount of debt for your firm?[a]

	%important or very important	Mean	Size		P/E		Leverage		Investment grade		Pay dividends		Industry		Management own.	
			Small	Large	Growth	Non-G	Low	High	Yes	No	Yes	No	Manu.	Others	Low	High
g) financial flexibility (we restrict debt so we have enough internal funds available to pursue new projects when they come along)	59.38	2.59	2.54	2.65 .	2.61	2.75 .	2.61	2.60 .	2.71	2.59 .	2.73	2.40 ***	2.67	2.52 .	2.68	2.41 **
d) our credit rating (as assigned by rating agencies)	57.10	2.46	1.92	3.14 ***	2.89	2.81 .	2.29	2.64 **	3.36	3.11 **	2.76	2.04 ***	2.52	2.39 .	2.81	1.99 ***
h) the volatility of our earnings and cash flows	48.08	2.32	2.29	2.36 .	2.41	2.25 .	2.25	2.32 .	2.11	2.44 **	2.33	2.28 .	2.35	2.31 .	2.32	2.41 .
a) the tax advantage of interest deductibility	44.85	2.07	1.77	2.44 ***	2.36	2.27 .	1.99	2.26 **	2.32	2.54 .	2.35	1.65 ***	2.30	1.79 ***	2.27	1.89 ***
e) the transactions costs and fees for issuing debt	33.52	1.95	2.07	1.81 **	1.98	1.80 .	1.94	1.87 .	1.85	2.06 .	1.91	2.02 .	1.89	1.95 .	1.88	2.02 .
c) the debt levels of other firms in our industry	23.40	1.49	1.29	1.77 ***	1.72	1.52 .	1.36	1.70 ***	1.80	1.71 .	1.63	1.34 **	1.38	1.66 **	1.57	1.37 *
b) the potential costs of bankruptcy, near-bankruptcy, or financial distress	21.35	1.24	1.36	1.10 **	1.29	1.02 *	1.16	1.37 *	0.99	1.40 **	1.27	1.21 .	1.31	1.22 .	1.30	1.33 .
i) we limit debt so our customers/suppliers are not worried about our firm going out of business	18.72	1.24	1.20	1.30 .	1.43	1.00 ***	1.34	1.20 .	1.23	1.14 .	1.19	1.30 .	1.21	1.40 *	1.17	1.45 **
n) we restrict our borrowing so that profits from new/future projects can be captured fully by shareholders and do not have to be paid out as interest to debtholders	12.57	1.01	1.16	0.80 ***	1.09	0.69 ***	1.18	0.83 ***	0.77	0.85 .	0.95	1.06 .	1.08	0.97 .	0.78	1.30 ***
j) we try to have enough debt that we are not an attractive takeover target	4.75	0.73	0.57	0.91 ***	0.95	0.86 .	0.62	0.90 ***	0.84	0.96 .	0.76	0.66 .	0.83	0.66 *	0.85	0.74 .
f) the personal tax cost our investors face when they receive interest income	4.79	0.68	0.59	0.72 *	0.53	0.80 **	0.68	0.63 .	0.87	0.51 ***	0.71	0.55 *	0.65	0.63 .	0.65	0.72 .
k) if we issue debt our competitors know that we are very unlikely to reduce our output	2.25	0.40	0.41	0.37 .	0.48	0.32 *	0.33	0.47 **	0.38	0.51 .	0.38	0.41 .	0.46	0.36 .	0.37	0.52 **
m) to ensure that upper management works hard and efficiently, we issue sufficient debt to make sure that a large portion of our cash flow is committed to interest payments	1.69	0.33	0.33	0.32 .	0.32	0.28 .	0.22	0.49 ***	0.28	0.38 .	0.32	0.34 .	0.40	0.26 **	0.33	0.35 .
l) a high debt ratio helps us bargain for concessions from our employees	0.00	0.16	0.16	0.15 .	0.18	0.13 .	0.13	0.19 *	0.14	0.17 .	0.13	0.19 *	0.18	0.15 .	0.17	0.18 .

Table 6 (continued)

What factors affect how you choose the appropriate amount of debt for your firm?

	%important or very important	Mean	CEO age		CEO tenure		CEO MBA		Regulated		Target debt ratio		Public corp.		Foreign sales		Fortune 500 mail	
			>59	Ynger	Long	Short	Yes	No	Yes	No	No	Yes	Yes	No	Yes	No	No	Yes
g) financial flexibility (we restrict debt so we have enough internal funds available to pursue new projects when they come along)	59.38	2.59	2.54	2.59 .	2.68	2.52 .	2.51	2.64 .	2.76	2.57 .	2.63	2.54 .	2.68	2.40 **	2.91	2.45 ***	2.60	2.55 .
d) our credit rating (as assigned by rating agencies)	57.10	2.46	2.52	2.44 .	2.28	2.56 **	2.37	2.50 .	3.59	2.32 ***	2.19	2.73 ***	2.86	1.68 ***	2.77	2.30 ***	2.26	3.31 ***
h) the volatility of our earnings and cash flows	48.08	2.32	2.38	2.33 .	2.40	2.29 .	2.22	2.40 *	2.27	2.31 .	2.34	2.26 .	2.34	2.31 .	2.43	2.27 .	2.32	2.30 .
a) the tax advantage of interest deductibility	44.85	2.07	2.15	2.05 .	1.92	2.14 *	2.11	2.07 .	2.64	1.98 **	2.03	2.13 .	2.24	1.76 ***	2.45	1.91 ***	1.97	2.53 ***
e) the transactions costs and fees for issuing debt	33.52	1.95	1.95	1.98 .	2.22	1.83 ***	2.03	1.97 .	1.71	1.95 .	2.02	1.89 .	1.92	2.03 .	1.98	1.94 .	2.00	1.70 **
c) the debt levels of other firms in our industry	23.40	1.49	1.43	1.52 .	1.46	1.53 .	1.61	1.45 .	2.32	1.40 ***	1.37	1.60 **	1.63	1.27 ***	1.41	1.51 .	1.41	1.86 ***
b) the potential costs of bankruptcy, near-bankruptcy, or financial distress	21.35	1.24	1.12	1.29 .	1.37	1.20 .	1.24	1.25 .	1.38	1.25 .	1.32	1.19 .	1.15	1.42 **	1.29	1.22 .	1.27	1.08 .
i) we limit debt so our customers/suppliers are not worried about our firm going out of business	18.72	1.24	1.32	1.23 .	1.39	1.17 **	1.23	1.25 .	1.33	1.23 .	1.27	1.24 .	1.27	1.16 .	1.20	1.26 .	1.30	0.98 **
n) we restrict our borrowing so that profits from new/future projects can be captured fully by shareholders and do not have to be paid out as interest to debtholders	12.57	1.01	0.99	1.00 .	1.05	0.97 .	1.04	0.98 .	0.86	1.02 .	1.03	0.99 .	0.95	1.10 .	1.01	1.00 .	1.12	0.48 ***
j) we try to have enough debt that we are not an attractive takeover target	4.75	0.73	0.82	0.70 .	0.78	0.70 .	0.76	0.73 .	0.71	0.71 .	0.71	0.77 .	0.94	0.34 ***	0.93	0.64 ***	0.70	0.88 *
f) the personal tax cost our investors face when they receive interest income	4.79	0.68	0.56	0.68 .	0.67	0.63 .	0.65	0.65 .	0.67	0.62 .	0.73	0.58 *	0.65	0.64 .	0.78	0.61 *	0.67	0.72 .
k) if we issue debt our competitors know that we are very unlikely to reduce our output	2.25	0.40	0.45	0.39 .	0.48	0.34 **	0.37	0.42 .	0.38	0.38 .	0.44	0.36 .	0.43	0.35 .	0.42	0.39 .	0.40	0.36 .
m) to ensure that upper management works hard and efficiently, we issue sufficient debt to make sure that a large portion of our cash flow is committed to interest payments	1.69	0.33	0.38	0.32 .	0.42	0.28 **	0.30	0.36 .	0.14	0.34 *	0.34	0.34 .	0.31	0.36 .	0.27	0.35 .	0.37	0.17 **
l) a high debt ratio helps us bargain for concessions from our employees	0.00	0.16	0.14	0.16 .	0.16	0.15 .	0.16	0.16 .	0.14	0.16 .	0.16	0.18 .	0.17	0.15 .	0.16	0.16 .	0.17	0.14 .

[a] Respondents are asked to rate on a scale of 0 (not important) to 4 (very important). We report the overall mean as well as the % of respondents that answered 3 and 4 (very important).

***, **, * denotes a significant difference at the 1%, 5% and 10% level, respectively. All table columns are defined in Table 1.

Table 7

Has your firm seriously considered issuing debt in foreign countries? (if "no", please go to the next question) If "yes", what factors affect your firm's decisions about issuing foreign debt?[a]

	%important or very important	Mean	Size		P/E		Leverage		Investment grade		Pay dividends		Industry		Management own.	
			Small	Large	Growth	Non-G	Low	High	Yes	No	Yes	No	Manu.	Others	Low	High
c) providing a "natural hedge" (e.g., if the foreign currency devalues, we are not obligated to pay interest in US$)	85.84	3.15	3.06	3.22 .	2.98	3.29 .	3.20	3.32 .	3.06	3.23 .	3.12	3.36 .	3.32	2.94 *	3.00	3.28 .
b) keeping the "source of funds" close to the "use of funds"	63.39	2.67	3.09	2.52 **	2.73	2.35 *	2.70	2.79 .	2.38	2.70 .	2.57	3.12 **	2.92	2.23 ***	2.55	2.74 .
a) favorable tax treatment relative to the U.S (e.g., different corporate tax rates)	52.25	2.26	1.94	2.41 **	2.27	2.29 .	2.26	2.39 .	2.37	2.40 .	2.29	2.08 .	2.36	2.13 .	2.16	2.33 .
e) foreign interest rates may be lower than domestic interest rates	44.25	2.19	2.33	2.11 .	2.27	2.03 .	2.22	2.13 .	2.20	2.48 .	2.08	2.40 .	2.22	2.10 .	2.04	2.54 **
d) foreign regulations require us to issue debt abroad	5.50	0.63	0.60	0.64 .	0.75	0.29 **	0.55	0.72 .	0.65	0.57 .	0.63	0.73 .	0.64	0.66 .	0.59	0.61 .

	%important or very important	Mean	CEO age		CEO tenure		CEO MBA		Regulated		Target debt ratio		Public corp.		Foreign sales		Fortune 500 mail	
			>59	Ynger	Long	Short	Yes	No	Yes	No	No	Yes	Yes	No	Yes	No	No	Yes
c) providing a "natural hedge" (e.g., if the foreign currency devalues, we are not obligated to pay interest in US$)	85.84	3.15	3.30	3.13 .	3.39	3.13 .	3.33	3.06 .	3.33	3.14 .	3.30	3.17 .	3.21	2.95 .	3.34	2.92 **	3.22	3.00 .
b) keeping the "source of funds" close to the "use of funds"	63.39	2.67	2.57	2.71 .	2.74	2.67 .	2.77	2.66 .	3.33	2.66 *	2.78	2.64 .	2.65	2.95 .	2.72	2.65 .	2.85	2.30 **
a) favorable tax treatment relative to the U.S (e.g., different corporate tax rates)	52.25	2.26	2.13	2.30 .	2.00	2.39 *	2.42	2.04 *	2.11	2.22 .	2.44	2.12 .	2.37	1.67 **	2.50	1.94 **	2.34	2.11 .
e) foreign interest rates may be lower than domestic interest rates	44.25	2.19	2.30	2.16 .	2.26	2.17 .	2.22	2.14 .	1.67	2.14 .	2.40	1.93 **	2.18	2.26 .	2.25	2.08 .	2.28	2.03 .
d) foreign regulations require us to issue debt abroad	5.50	0.63	0.77	0.57 .	0.50	0.69 .	0.60	0.58 .	1.11	0.57 *	0.57	0.64 .	0.61	0.56 .	0.59	0.64 .	0.64	0.62 .

[a] Respondents are asked to rate on a scale of 0 (not important) to 4 (very important). We report the overall mean as well as the % of respondents that answered 3 and 4 (very important).

***, **, * denotes a significant difference at the 1%, 5% and 10% level, respectively. All table columns are defined in Table 1.

Table 8

Has your firm seriously considered issuing common stock? (if “no”, please go to the next question) If "yes", what factors affect your firm's decisions about issuing common stock?[a]

	%important or very important	Mean	Size		P/E		Leverage		Investment grade		Pay dividends		Industry		Management own.	
			Small	Large	Growth	Non-G	Low	High	Yes	No	Yes	No	Manu.	Others	Low	High
m) Earnings Per Share dilution	68.55	2.84	2.65	3.12 **	3.17	3.03 .	2.81	2.93 .	3.00	3.18 .	3.06	2.63 **	3.03	2.60 **	3.07	2.63 **
k) the amount by which our stock is undervalued or overvalued by the market	66.94	2.69	2.67	2.71 .	2.94	2.65 .	2.50	2.93 **	2.58	3.08 **	2.70	2.66 .	2.76	2.50 .	2.93	2.47 **
a) if our stock price has recently risen, the price at which we can sell is “high”	62.60	2.53	2.57	2.47 .	2.57	2.61 .	2.45	2.67 .	2.42	2.92 *	2.35	2.69 *	2.79	2.26 **	2.62	2.45 .
c) providing shares to employee bonus/stock option plans	53.28	2.34	2.22	2.50 .	2.20	2.38 .	2.66	2.00 ***	2.77	1.97 **	2.46	2.17 .	2.16	2.47 .	2.34	2.30 .
e) maintaining a target debt-to-equity ratio	51.59	2.26	2.04	2.58 **	2.56	2.03 **	1.86	2.68 ***	2.44	2.58 .	2.68	1.85 ***	2.48	1.91 **	2.64	1.84 ***
j) diluting the holdings of certain shareholders	50.41	2.14	2.30	1.90 *	1.94	2.23 .	2.20	2.09 .	1.46	2.24 **	1.97	2.31 .	1.95	2.20 .	2.00	2.38 *
b) stock is our “least risky” source of funds	30.58	1.76	1.93	1.52 *	2.07	1.37 ***	1.80	1.71 .	1.44	1.68 .	1.56	1.97 *	1.76	1.69 .	1.62	1.91 .
g) whether our recent profits have been sufficient to fund our activities	30.40	1.76	1.91	1.54 *	1.93	1.39 **	1.71	1.79 .	1.52	1.82 .	1.67	1.76 .	1.84	1.69 .	1.60	1.88 .
f) using a similar amount of equity as is used by other firms in our industry	22.95	1.45	1.33	1.63 *	1.70	1.00 ***	1.35	1.57 .	1.56	1.43 .	1.74	1.09 ***	1.36	1.38 .	1.59	1.32 .
h) issuing stock gives investors a better impression of our firm's prospects than issuing debt	21.49	1.31	1.52	1.00 **	1.48	0.89 ***	1.22	1.37 .	0.92	1.43 **	1.10	1.46 *	1.14	1.50 *	1.18	1.51 *
l) inability to obtain funds using debt, convertibles, or other sources	15.57	1.15	1.36	0.84 **	1.00	0.79 .	1.09	1.20 .	0.68	1.45 ***	1.03	1.19 .	1.03	1.22 .	1.16	1.21 .
d) common stock is our cheapest source of funds	14.05	1.10	1.35	0.73 ***	1.02	0.97 .	1.26	0.96 .	0.68	0.68 .	0.93	1.28 *	0.98	1.17 .	0.86	1.36 **
i) the capital gains tax rates faced by our investors (relative to tax rates on dividends)	5.00	0.82	0.78	0.88 .	0.88	0.79 .	0.98	0.63 **	0.80	0.92 .	0.80	0.77 .	0.75	0.92 .	0.81	0.88 .

Table 8 (continued)

Has your firm seriously considered issuing common stock? (if “no”, please go to the next question) If "yes", what factors affect your firm's decisions about issuing common stock?

	%important or very important	Mean	CEO age		CEO tenure		CEO MBA		Regulated		Target debt ratio		Public corp.		Foreign sales		Fortune 500 mail	
			>59	Ynger	Long	Short	Yes	No	Yes	No	No	Yes	Yes	No	Yes	No	No	Yes
m) Earnings Per Share dilution	68.55	2.84	3.04	2.81 .	2.64	3.00 *	2.62	2.95 *	3.64	2.72 ***	2.69	2.97 .	3.18	1.48 ***	2.89	2.80 .	2.73	3.29 **
k) the amount by which our stock is undervalued or overvalued by the market	66.94	2.69	2.52	2.74 .	2.86	2.60 .	2.73	2.67 .	2.43	2.69 .	2.69	2.66 .	2.90	1.78 ***	2.96	2.58 *	2.74	2.43 .
a) if our stock price has recently risen, the price at which we can sell is “high”	62.60	2.53	2.54	2.55 .	2.51	2.56 .	2.45	2.56 .	2.64	2.50 .	2.47	2.57 .	2.70	1.83 ***	2.36	2.59 .	2.46	2.79 .
c) providing shares to employee bonus/stock option plans	53.28	2.34	2.65	2.23 *	2.44	2.29 .	2.13	2.42 .	2.15	2.31 .	2.28	2.38 .	2.24	2.72 **	2.50	2.29 .	2.24	2.74 **
e) maintaining a target debt-to-equity ratio	51.59	2.26	1.72	2.41 **	2.12	2.38 .	1.79	2.46 ***	3.14	2.11 ***	1.71	2.68 ***	2.40	1.73 **	2.21	2.24 .	2.24	2.38 .
j) diluting the holdings of certain shareholders	50.41	2.14	2.32	2.13 .	2.27	2.14 .	2.16	2.19 .	2.00	2.16 .	2.24	2.02 .	2.25	1.68 **	1.93	2.20 .	2.25	1.65 **
b) stock is our “least risky” source of funds	30.58	1.76	1.71	1.74 .	1.72	1.73 .	1.53	1.83 .	1.69	1.75 .	1.79	1.73 .	1.79	1.62 .	1.82	1.75 .	1.90	1.17 **
g) whether our recent profits have been sufficient to fund our activities	30.40	1.76	1.36	1.86 **	1.84	1.73 .	1.42	1.91 **	1.69	1.70 .	1.75	1.77 .	1.73	1.80 .	1.55	1.80 .	1.88	1.22 **
f) using a similar amount of equity as is used by other firms in our industry	22.95	1.45	1.12	1.52 *	1.41	1.47 .	1.13	1.58 **	2.15	1.30 **	1.46	1.37 .	1.43	1.54 .	1.11	1.54 *	1.48	1.30 .
h) issuing stock gives investors a better impression of our firm's prospects than issuing debt	21.49	1.31	0.92	1.39 **	1.32	1.30 .	1.11	1.41 .	1.23	1.28 .	1.24	1.36 .	1.29	1.33 .	1.21	1.35 .	1.41	0.91 **
l) inability to obtain funds using debt, convertibles, or other sources	15.57	1.15	0.79	1.26 *	1.32	1.10 .	0.76	1.35 ***	1.38	1.09 .	1.22	1.10 .	1.06	1.42 .	0.72	1.29 **	1.20	0.91 .
d) common stock is our cheapest source of funds	14.05	1.10	0.88	1.12 .	1.00	1.12 .	1.16	1.05 .	0.69	1.15 .	1.32	0.92 **	1.01	1.46 *	1.11	1.11 .	1.23	0.52 ***
i) the capital gains tax rates faced by our investors (relative to tax rates on dividends)	5.00	0.82	0.79	0.80 .	0.95	0.72 .	0.57	0.92 **	0.38	0.81 *	0.84	0.76 .	0.84	0.71 .	0.93	0.78 .	0.81	0.83 .

[a] Respondents are asked to rate on a scale of 0 (not important) to 4 (very important). We report the overall mean as well as the % of respondents that answered 3 and 4 (very important).

***, **, * denotes a significant difference at the 1%, 5% and 10% level, respectively. All table columns are defined in Table 1.

Table 9

What other factors affect your firm's debt policy?[a]

	%important or very important	Mean	Size		P/E		Leverage		Investment grade		Pay dividends		Industry		Management own.	
			Small	Large	Growth	Non-G	Low	High	Yes	No	Yes	No	Manu.	Others	Low	High
c) we issue debt when interest rates are particularly low	46.35	2.22	2.07	2.40 **	2.35	2.42 .	2.13	2.29 .	2.40	2.43 .	2.37	1.98 ***	2.25	2.16 .	2.39	2.02 ***
a) we issue debt when our recent profits (internal funds) are not sufficient to fund our activities	46.78	2.13	2.30	1.88 ***	2.09	1.86 .	2.10	2.12 .	1.81	2.28 **	2.09	2.16 .	2.24	1.94 **	2.14	2.13 .
d) we use debt when our equity is undervalued by the market	30.79	1.56	1.37	1.76 ***	2.14	1.85 .	1.52	1.72 .	1.56	2.17 ***	1.65	1.37 *	1.67	1.47 .	1.83	1.49 **
g) changes in the price of our common stock	16.38	1.08	0.91	1.25 ***	1.45	1.38 .	0.96	1.27 **	1.05	1.52 ***	1.14	0.95 .	1.14	1.01 .	1.25	1.07 .
e) we delay issuing debt because of transactions costs and fees	10.17	1.06	1.25	0.83 ***	1.06	0.87 .	1.09	1.00 .	0.90	0.92 .	0.97	1.20 **	1.06	1.07 .	0.92	1.22 **
f) we delay retiring debt because of recapitalization costs and fees	12.43	1.04	1.04	1.05 .	1.16	1.04 .	0.91	1.18 **	1.10	1.30 .	1.13	0.93 *	1.19	0.86 ***	1.05	1.02 .
b) using debt gives investors a better impression of our firm's prospects than issuing common stock	9.83	0.96	0.85	1.05 *	1.19	1.14 .	0.91	1.09 .	1.00	1.39 **	1.00	0.84 .	1.01	0.87 .	1.07	0.95 .
h) we issue debt when we have accumulated substantial profits	1.14	0.53	0.50	0.55 .	0.61	0.55 .	0.46	0.54 .	0.57	0.60 .	0.55	0.50 .	0.58	0.45 .	0.61	0.52 .

	%important or very important	Mean	CEO age		CEO tenure		CEO MBA		Regulated		Target debt ratio		Public corp.		Foreign sales		Fortune 500 mail	
			>59	Ynger	Long	Short	Yes	No	Yes	No	No	Yes	Yes	No	Yes	No	No	Yes
c) we issue debt when interest rates are particularly low	46.35	2.22	2.13	2.26 .	2.24	2.21 .	2.36	2.15 .	2.19	2.20 .	2.30	2.12 .	2.39	1.90 ***	2.38	2.15 .	2.19	2.35 .
a) we issue debt when our recent profits (internal funds) are not sufficient to fund our activities	46.78	2.13	2.24	2.09 .	2.35	2.00 **	2.09	2.18 .	2.00	2.14 .	2.21	2.00 .	2.01	2.33 **	1.93	2.18 .	2.21	1.75 **
d) we use debt when our equity is undervalued by the market	30.79	1.56	1.51	1.57 .	1.44	1.60 .	1.50	1.58 .	1.86	1.50 .	1.63	1.46 .	2.10	0.54 ***	1.89	1.41 ***	1.54	1.67 .
g) changes in the price of our common stock	16.38	1.08	0.95	1.11 .	1.05	1.06 .	1.04	1.08 .	1.10	1.04 .	1.16	0.99 .	1.48	0.31 ***	1.15	1.02 .	1.08	1.10 .
e) we delay issuing debt because of transactions costs and fees	10.17	1.06	0.97	1.09 .	1.27	0.95 ***	1.13	1.06 .	0.76	1.10 .	1.13	0.99 .	1.03	1.15 .	1.11	1.05 .	1.17	0.57 ***
f) we delay retiring debt because of recapitalization costs and fees	12.43	1.04	1.08	1.01 .	1.20	0.93 **	1.10	0.98 .	1.05	1.06 .	1.07	0.99 .	1.14	0.87 **	1.22	0.97 *	1.07	0.89 .
b) using debt gives investors a better impression of our firm's prospects than issuing common stock	9.83	0.96	1.10	0.90 .	0.94	0.95 .	0.79	1.04 **	1.10	0.91 .	1.01	0.91 .	1.18	0.51 ***	1.00	0.92 .	0.92	1.14 .
h) we issue debt when we have accumulated substantial profits	1.14	0.53	0.51	0.53 .	0.61	0.46 *	0.45	0.58 .	0.71	0.52 .	0.56	0.50 .	0.56	0.47 .	0.57	0.51 .	0.52	0.55 .

[a] Respondents are asked to rate on a scale of 0 (not important) to 4 (very important). We report the overall mean as well as the % of respondents that answered 3 and 4 (very important).

***, **, * denotes a significant difference at the 1%, 5% and 10% level, respectively. All table columns are defined in Table 1.

Table 10

Has your firm seriously considered issuing convertible debt? (if “no”, please go to the next question) If "yes", what factors affect your firm's decisions about issuing convertible debt?[a]

	%important or very important	Mean	Size		P/E		Leverage		Investment grade		Pay dividends		Industry		Management own.	
			Small	Large	Growth	Non-G	Low	High	Yes	No	Yes	No	Manu.	Others	Low	High
a) convertibles are an inexpensive way to issue "delayed" common stock	58.11	2.49	2.54	2.43 .	2.67	2.50 .	2.38	2.60 .	2.73	2.42 .	2.59	2.43 .	2.40	2.57 .	2.42	2.52 .
f) our stock is currently undervalued	50.68	2.34	2.26	2.44 .	2.72	2.19 *	2.21	2.52 .	2.40	2.64 .	2.25	2.46 .	2.41	2.43 .	2.28	2.42 .
g) ability to “call” or force conversion of convertible debt if/when we need to	47.95	2.29	2.28	2.29 .	2.58	2.56 .	2.32	2.20 .	2.21	2.65 .	2.42	2.17 .	2.26	2.33 .	2.08	2.52 *
e) avoiding short-term equity dilution	45.83	2.18	2.03	2.35 .	2.45	2.19 .	2.15	2.28 .	2.47	2.38 .	2.44	1.97 *	2.23	2.14 .	2.05	2.33 .
h) to attract investors unsure about the riskiness of our company	43.84	2.07	2.35	1.73 **	1.88	1.88 .	2.02	2.10 .	1.36	1.88 *	1.83	2.31 *	2.00	2.13 .	1.82	2.47 **
c) convertibles are less expensive than straight debt	41.67	1.85	2.08	1.58 *	1.56	2.31 **	1.80	1.83 .	1.43	1.80 .	1.57	2.14 **	1.58	2.10 *	1.71	2.00 .
d) other firms in our industry successfully use convertibles	12.50	1.10	1.12	1.06 .	1.22	0.69 *	1.29	0.83 **	0.93	1.25 .	0.86	1.21 *	0.92	1.30 *	1.05	1.06 .
b) protecting bondholders against unfavorable actions by managers or stockholders	1.41	0.62	0.61	0.64 .	0.72	0.31 **	0.57	0.66 .	0.43	0.64 .	0.54	0.71 .	0.58	0.72 .	0.61	0.67 .

	%important or very important	Mean	CEO age		CEO tenure		CEO MBA		Regulated		Target debt ratio		Public corp.		Foreign sales		Fortune 500 mail	
			>59	Ynger	Long	Short	Yes	No	Yes	No	No	Yes	Yes	No	Yes	No	No	Yes
a) convertibles are an inexpensive way to issue "delayed" common stock	58.11	2.49	2.79	2.46 .	2.74	2.42 .	2.61	2.47 .	2.78	2.51 .	2.36	2.68 .	2.54	2.27 .	2.52	2.41 .	2.51	2.41 .
f) our stock is currently undervalued	50.68	2.34	2.00	2.45 .	2.28	2.42 .	1.87	2.57 **	2.78	2.27 .	2.30	2.32 .	2.45	1.93 *	2.48	2.25 .	2.30	2.47 .
g) ability to “call” or force conversion of convertible debt if/when we need to	47.95	2.29	2.64	2.21 .	2.42	2.22 .	1.91	2.39 *	2.25	2.28 .	2.23	2.37 .	2.29	2.27 .	2.48	2.20 .	2.28	2.31 .
e) avoiding short-term equity dilution	45.83	2.18	2.00	2.25 .	2.28	2.16 .	2.00	2.24 .	3.11	2.10 **	2.05	2.37 .	2.21	2.07 .	2.24	2.12 .	2.05	2.59 *
h) to attract investors unsure about the riskiness of our company	43.84	2.07	2.29	2.00 .	2.00	2.08 .	1.57	2.33 ***	1.88	2.12 .	2.32	1.63 **	1.77	3.07 ***	2.00	2.10 .	2.16	1.75 .
c) convertibles are less expensive than straight debt	41.67	1.85	2.50	1.70 **	1.94	1.76 .	2.04	1.78 .	1.38	1.93 .	2.07	1.44 **	1.81	2.00 .	1.81	1.86 .	2.02	1.25 **
d) other firms in our industry successfully use convertibles	12.50	1.10	1.00	1.11 .	0.72	1.25 **	0.57	1.33 ***	1.50	0.95 *	1.33	0.78 **	1.09	1.00 .	1.33	1.00 .	1.18	0.80 .
b) protecting bondholders against unfavorable actions by managers or stockholders	1.41	0.62	1.08	0.53 ***	0.61	0.66 .	0.48	0.73 *	0.62	0.59 .	0.60	0.67 .	0.61	0.67 .	0.62	0.62 .	0.64	0.56 .

[a] Respondents are asked to rate on a scale of 0 (not important) to 4 (very important). We report the overall mean as well as the % of respondents that answered 3 and 4 (very important).

***, **, * denotes a significant difference at the 1%, 5% and 10% level, respectively. All table columns are defined in Table 1.

Table 11

What factors affect your firm's choice between short- and long-term debt?[a]

	%important or very important	Mean	Size: Small	Size: Large	P/E: Growth	P/E: Non-G	Leverage: Low	Leverage: High	Investment grade: Yes	Investment grade: No	Pay dividends: Yes	Pay dividends: No	Industry: Manu.	Industry: Others	Management own.: Low	Management own.: High
b) matching the maturity of our debt with the life of our assets	63.25	2.60	2.69	2.46 **	2.70	2.46 *	2.57	2.63 .	2.60	2.45 .	2.53	2.67 .	2.51	2.72 *	2.54	2.62 .
g) we issue long-term debt to minimize the risk of having to refinance in "bad times"	48.83	2.15	2.05	2.29 *	2.31	2.03 *	1.95	2.55 ***	2.26	2.51 *	2.22	2.05 .	2.39	1.79 ***	2.18	2.10 .
a) we issue short term when short term interest rates are low compared to long term rates	35.94	1.89	1.79	2.01 **	1.97	2.11 .	1.82	1.93 .	2.22	2.05 .	2.00	1.74 **	2.03	1.77 **	1.95	1.67 **
c) we issue short-term when we are waiting for long-term market interest rates to decline	28.70	1.78	1.66	1.93 **	2.01	1.82 .	1.67	1.90 **	2.00	2.02 .	1.91	1.61 ***	1.90	1.65 **	1.82	1.67 .
d) we borrow short-term so that returns from new projects can be captured more fully by shareholders, rather than committing to pay long-term profits as interest to debtholders	9.48	0.94	1.03	0.80 **	0.87	0.89 .	1.01	0.85 *	0.84	0.77 .	0.98	0.87 .	1.05	0.81 **	0.89	0.97 .
e) we expect our credit rating to improve, so we borrow short-term until it does	8.99	0.85	0.86	0.84 .	0.87	0.68 *	0.79	0.99 *	0.66	1.18 ***	0.73	0.99 **	0.89	0.85 .	0.89	0.87 .
f) borrowing short-term reduces the chance that our firm will want to take on risky projects	4.02	0.53	0.62	0.40 ***	0.54	0.32 **	0.56	0.49 .	0.36	0.56 **	0.47	0.59 *	0.53	0.51 .	0.40	0.70 ***

	%important or very important	Mean	CEO age: >59	CEO age: Ynger	CEO tenure: Long	CEO tenure: Short	CEO MBA: Yes	CEO MBA: No	Regulated: Yes	Regulated: No	Target debt ratio: No	Target debt ratio: Yes	Public corp.: Yes	Public corp.: No	Foreign sales: Yes	Foreign sales: No	Fortune 500 mail: No	Fortune 500 mail: Yes
b) matching the maturity of our debt with the life of our assets	63.25	2.60	2.28	2.69 ***	2.69	2.53 .	2.59	2.64 .	2.81	2.60 .	2.53	2.66 .	2.47	2.85 ***	2.33	2.69 ***	2.65	2.39 *
g) we issue long-term debt to minimize the risk of having to refinance in "bad times"	48.83	2.15	2.09	2.20 .	2.25	2.12 .	2.20	2.15 .	2.48	2.15 .	2.00	2.36 ***	2.23	2.02 *	2.40	2.06 **	2.11	2.31 .
a) we issue short term when short term interest rates are low compared to long term rates	35.94	1.89	1.78	1.93 .	1.87	1.90 .	1.98	1.87 .	1.95	1.86 .	1.93	1.85 .	2.00	1.72 **	2.11	1.80 **	1.86	2.03 .
c) we issue short-term when we are waiting for long-term market interest rates to decline	28.70	1.78	1.68	1.80 .	1.79	1.78 .	1.74	1.79 .	2.40	1.71 ***	1.72	1.87 .	1.93	1.50 ***	2.00	1.69 **	1.74	1.94 .
d) we borrow short-term so that returns from new projects can be captured more fully by shareholders, rather than committing to pay long-term profits as interest to debtholders	9.48	0.94	0.86	0.95 .	0.98	0.90 .	0.99	0.89 .	0.90	0.93 .	0.96	0.90 .	0.87	1.07 **	0.95	0.93 .	0.99	0.70 **
e) we expect our credit rating to improve, so we borrow short-term until it does	8.99	0.85	0.79	0.87 .	0.89	0.82 .	0.84	0.87 .	0.90	0.85 .	0.98	0.65 ***	0.88	0.82 .	0.89	0.85 .	0.89	0.70 *
f) borrowing short-term reduces the chance that our firm will want to take on risky projects	4.02	0.53	0.51	0.53 .	0.66	0.44 ***	0.45	0.56 .	0.43	0.54 .	0.55	0.51 .	0.46	0.67 **	0.44	0.57 *	0.59	0.29 ***

[a] Respondents are asked to rate on a scale of 0 (not important) to 4 (very important). We report the overall mean as well as the % of respondents that answered 3 and 4 (very important).

***, **, * denotes a significant difference at the 1%, 5% and 10% level, respectively. All table columns are defined in Table 1.

Table 12
Summary of the relation between survey evidence and capital structure theories.

A capital structure theory or concept is listed in the first column, followed by the related survey evidence in the right column. ✔ (✖) indicates that the evidence drawn from the unconditional responses to a survey question supports (does not support) the idea in the first column. An indented ✓ (x) indicates whether the survey evidence supports (does not support) the idea conditional on firm characteristics or other detailed analysis. The conditional (i.e., indented) evidence usually qualifies the unconditional result it lies directly below. Div stands for dividend.

Theory or concept	Survey evidence
<u>Trade-off theory of choosing optimal debt policy</u> Trade-off benefits and costs of debt (Scott, 1976). Often tax benefits are traded off with expected distress costs or personal tax costs (Miller, 1977).	✔corporate interest deductions moderately important. ✔foreign tax treatment moderately important. ✔cash flow volatility important. ✖expected distress/bankruptcy costs not important. ✔maintaining financial flexibility important (⇒ E(distress costs) low). x unrelated to whether firm has target debt ratio. ✖personal taxes not important to debt or equity decision.
<u>Firms have target debt ratios</u> A static version of the trade-off theory implies that firms have an optimal, target debt ratio.	✔44% have strict or somewhat strict target/range. ✔target D/E moderately important for equity issuance decision. ✖37% have flexible and 19% have no target/range. ✖issue equity after stock price increase. ✖changes in stock price not important to debt decision. ✖execs say same-industry debt ratios are not important. ✓there are industry patterns in reported debt ratios.

<u>The effect of transactions costs on debt ratios</u>:
T. costs can affect the cost of external funds. Firms may avoid or delay issuing or retiring security because of issuance/recapitalization cost (Fisher, Heinkel, and Zechner, 1989)
	✔transactions costs affect debt policy.
	  ✓more important for small firms.
	✖absolute importance of T. costs in delaying debt issue is small.
	  ✓T. costs relatively important for small, no div firms.
	✖T. costs do not cause firms to delay debt retirement.

<u>Pecking-order theory of financing hierarchy</u>:
Financial securities can be undervalued due to informational asymmetry between managers and investors. Firms should use securities in reverse order of asymmetry: use internal funds first, debt second, convertible security third, equity last.
To avoid need for external funds, firms may prefer to store excess cash (Myers and Majluf, 1984).
	✔firms value financial flexibility.
	  x desire for flexibility is unrelated to degree of informational asymmetry (size) or growth status.
	  x flexibility less important for no-dividend firms.
	✔issue debt when internal funds are insufficient.
	  ✓more important for small firms.
	  x no relation to growth or dividend status.
	✔issue equity when internal funds insufficient.
	  ✓relatively important for small firms.
	✔equity issuance decision affected by equity undervaluation.
	  x no relation to size, dividend status, executive ownership.
	✖equity issuance decision unaffected by ability to obtain funds from debt, convertibles, or other sources.
	✖debt issuance unaffected by equity valuation.
	  x even less important for small, growth, no-div firms.

<u>Stock price</u>: Recent increase in stock price presents a "window of opportunity" to issue equity (Loughran and Ritter, 1998). If stock undervalued due to informational asymmetry, issue after information release and ensuing stock price increase (Lucas and MacDonald, 1990)	✔issue equity when stock price has risen ✓recent price increase most important for firms that do not pay dividends (significant) and small firms (not significant).
<u>Credit ratings</u>: firms issue short-term if they expect their credit rating to improve (Flannery, 1986).	✔In general, rating is very important to debt decision. ✖short-term debt not used to time rating improvement.
<u>Interest rates</u>: do absolute coupon rates or relative rates between long- and short-term debt affect when debt is issued?	✔issue debt when interest rates low. ✔short-term debt used only moderately to time the level of interest rates or because of yield curve slope.

Table 12 (continued)

Theory or concept	Survey evidence
Underinvestment: firm may pass up NPV>0 project because profits flow to existing bondholders. Can attenuate by limiting debt or using short-term debt. Most severe for growth firms. (Myers, 1977)	✖low absolute importance of limiting the use of debt, or borrowing short-term, to avoid underinvestment. x growth status has no effect on relative use of short-term debt. ✓growth status affects relative importance of overall debt policy.
Asset substitution: shareholders take on risky projects to expropriate wealth from bondholders (Jensen and Meckling, 1976). Using convertible debt (Green, 1984) or short-term debt (Myers, 1977) attenuates asset substitution, relative to using long-term debt.	✖neither convertible debt nor short-term debt is used to protect bondholders from the firm/shareholders taking on risky or unfavorable projects.
Free Cash Flow can lead to overinvestment or inefficiency: Fixed commitments like debt payments commit free cash so management works hard and efficiently (Jensen, 1986).	✖debt is not used with intent of commiting free cash flows.
Product Market and Industry Influences:	
Debt policy credibly signals production decisions (Brander and Lewis, 1986).	✖debt policy is not used to signal production intentions.
Sensitive firms use less debt so customers/suppliers do not worry about firm entering distress (Titman, 1984)	✖absolute importance of this explanation is low. x not important for high-tech firms. ✓relatively important for growth firms.
Debt ratios are industry-specific (Bradley et al., 1984).	✖firms report that the debt, equity, and convertibles usage of same-industry firms does not affect financing decisions. ✓debt ratios differ systematically across industries.
Corporate Control:	
Capital structure can be used to affect the likelihood of success for a takeover bid/control contest. Managers may issue debt to increase their effective ownership (Harris and Raviv, 1988; Stulz, 1988).	✔equity issued to dilute holdings of particular shareholders. x dilution strategy unrelated to managerial share ownership. ✖takeover threat does not affect debt decisions.
Risk Management: finance foreign operations with foreign debt as a means of hedging FX risk.	✔foreign debt is frequently viewed as a natural hedge.
Maturity-matching: match maturity between assets and liabilities.	✔important to choice between short- and long-term debt.
Cash Management: match cash outflows to cash inflows.	✔long-term debt reduces the need to refinance in bad times. ✓spread out required principal repayments or link principal repayment to expected ability to repay.
Employee stock/bonus plans: shares of stock needed to implement employee compensation plans.	✔when funding employee plans, firms avoid issuing shares, which would dilute the holdings of existing shareholders.
Bargaining with employees: high debt allows effective bargaining with employees (Chang, 1992).	✖debt policy is not used as bargaining device.
Earnings per share dilution	✔important to equity issuance decision.

Written Evidence of Dr. Cleary filed in the 2023 Alberta Generic Cost of Capital Proceedings

Exhibit AW

Corporate Finance Practices in Canada: Where Do We Stand?

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This study investigates the financial practices of Canadian firms involving capital budgeting, cost of capital estimation, capital structure, and real options. Survey respondents express a strong preference for net present value followed by internal rate of return and payback methods. The least popular capital budgeting technique is real options. Unlike their U.S. and European counterparts, Canadian firms rely more on subjective risk assessments in adjusting their discount rate. The use of subjective judgment by Canadian managers also applies to risk analysis, forecasting project cash flows, and estimating the cost of equity capital. This finding differs markedly from the widespread use of the capital asset pricing model by U.S. and European firms. In examining capital structure choice, the results show support for trade-off theory relative to pecking order theory. Finally, firm size and the education of the chief executive officer influence corporate finance decisions. (JEL: G35)

Keywords: Capital budgeting, cost of capital, risk analysis, real options.

I. Introduction

This study presents survey results from a large sample of Canadian firms designed to investigate practices involving capital budgeting, cost of equity estimation, capital structure preferences, and real options. For

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decades these topics have received much attention from both the academic and professional community with Istvan (1961) providing one of the earliest empirical studies. More recent studies conclude that corporate finance practices have become more aligned with finance theory over time. For instance, Gitman and Vandenberg (2000), who examine cost of capital estimation techniques in large U.S. firms using the same survey instrument as in their earlier 1980 study (Gitman and Mercurio, 1982), find an increase in the popularity of the capital asset pricing model (CAPM).

Most studies of corporate finance practices focus on large U.S. firms. Few researchers except Jog and Srivastava (1995) examine the Canadian market. However, they only investigate large firms and use a survey covering few capital budgeting, risk assessment, and cost of capital techniques. For instance, these authors investigate only four capital budgeting techniques: accounting rate of return (ARR), payback period (PBP), internal rate of return (IRR), and net present value (NPV). By contrast, the current survey covers nine capital budgeting techniques including real options, and uses a sample nearly twice that of Jog and Srivastava. Moreover, while the current study surveys all Canadian public firms, Jog and Srivastava examine only large firms. This limitation reduces the scope of their study and prevents possible generalization of their findings to the entire Canadian context. In contrast, the non-response bias analysis, which is discussed in Section III, suggests that the sample is representative of the population of Canadian public firms with respect to size but also to several other dimensions. Further, unlike Jog and Srivastava (1995), survey responses from the current study are examined conditional on firm size and CEO education as in Graham and Harvey (2001). Finally, given that Jog and Srivastava conducted their survey in 1991 and the growing interest in corporate finance practices in the academic literature, a need exists for a current and more comprehensive study on Canadian finance practices.

Athanassakos (2007) uses a sample of large Canadian public firms to examine the use of value-based management (VMB) methods and how they influence a firm’s stock performance. He also identifies characteristics of both firms and management that increase the likelihood of employing VMB methods. Although this study is not directly comparable to the stream of capital budgeting studies that use a survey approach, it provides good insights on how corporate finance practices influence shareholders’ wealth.

Graham and Harvey (2001) survey U.S. and Canadian executives who are members of the Financial Executive Institute (FEI) but they do not specify the percentage of Canadian managers responding to their survey. The results show that their findings reflect mainly the United States view and are similar to previous U.S. surveys. For example, Graham and Harvey report that most chief executive officers (CEOs) use CAPM to compute the cost of equity. Yet, the results show that the majority of responding Canadian firms use subjective judgment with a substantially lower percentage using CAPM. One possibility for this difference is that the low proportion of Canadian executives included in the Graham and Harvey study dilutes the Canadian view.

Other studies (Chew, 1997; La Porta et al., 1998; Rajan and Zingales, 2003; Lasfer and Alzahrani, 2009; Aggarwal et al., 2009) stress the importance of country-level variables in shaping a firm's corporate decisions. For example, Brounen, De Jong, and Koedijk (2004) find that capital budgeting practices in Europe tend to vary by country of origin. As Baker et al. (2009) observe, several major differences exist between the United States and Canadian contexts that could affect corporate finance practices. For example, Canadian firms are smaller in size, have more concentrated ownership structure and weaker corporate governance than their U.S. counterparts (Morck, Stangeland, and Yeung, 2001; King and Segal, 2003; Bris, 2005; Leung, Meh, and Terajima, 2008). Section V provides a discussion of how these differences help explain the discrepancies between U.S. and the Canadian survey results. Thus, combining the views of U.S. and Canadian executives could distort the results reported by Graham and Harvey (2001).

Capital budgeting surveys typically share the same main goal of assessing whether firm practices conform to finance theory. With the notable exception of Graham and Harvey (2001) and Brounen, De Jong, and Koedijk (2004), these studies focus mainly on the popularity of traditional capital budgeting techniques. Although finance theory favors discounted cash flow (DCF) techniques to less conceptually correct methods, DCF techniques have limitations. For instance, DCF methods often fail to provide sound valuation when the business environment is uncertain and ignore the value created by flexibility in management decisions (Brealey, Myers, and Allen, 2007). Using a real options approach can help to overcome these limitations and to provide more accurate valuation than the static DCF approaches (Brennan and Schwartz, 1985; Paddock, Siegel, and Smith, 1988; Pindyck, 1991; Ingersoll and Ross, 1992; Trigeorgis, 1993).

In practice, top managers do not appear to share the increasing interest in real options from academicians and financial professionals with similar enthusiasm. As Chance and Peterson (2002, p. 95) note, "Empirical research has provided some, but very limited, support for the real-world applicability of real options models." According to the Canadian survey results, the real options approach is the least popular of the nine capital budgeting techniques presented in the survey with only 17% of participants indicating using them. Graham and Harvey (2001) and Block (2007) document this relatively weak support for real options in the United States, while Brounen, De Jong, and Koedijk (2004) find similar results in Europe. These surveys, however, provide little rationale for the low popularity of real options because they simply report the percentage of responding firms using real options. While Triantis and Borison (2001) ask firms why they use real options, they examine only 35 companies that are already using or considering real options. Hence, survey evidence on why firms do not use real options is largely absent from the literature. This study attempts to uncover some reasons or obstacles inhibiting firms from using real options. Specifically, the study provides evidence about the importance that respondents attach to eight reasons for not using real options such as a lack of expertise or knowledge and the complexity of applying real options in practice. Identifying these reasons may help both academicians and financial professionals become aware of factors limiting the use of real options.

This study contributes to the literature on corporate finance practices in several ways. First, although many surveys examine corporate finance practices, few report evidence from Canadian firms. This study provides the most comprehensive examination of Canadian firms regarding capital budgeting techniques, cost of capital estimation, and capital structure to date and permits determining whether such practices have evolved over time. Baker, Singleton, and Veit (2011) provide for a synthesis of the survey-based literature on corporate finance practices. Second, this approach permits examining the extent to which corporate finance practices documented from numerous U.S. studies hold in Canada. Third, this investigation of real options provides new insights about why managers use and do not use real options when making capital budgeting decisions. Fourth, the study provides a basis for examining the level of support for two competing capital structure theories – the static trade-off theory and pecking order theory. Finally, the study examines how firm characteristics and CEO education may affect finance practices in Canada. Graham and Harvey (2001), for instance, find that firm size and whether the CEO holds an MBA degree shape corporate finance practices of U.S. firms. Given the differences between the United States and Canada, determining whether these two dimensions affect Canadian finance practices is important.

Survey-based research offers several benefits. The main point of conducting a survey is to get information that is otherwise unavailable. Thus, the survey approach can provide unique information that complements the results obtained from traditional large-sample analysis. As Graham and Harvey (2001) note, large-sample studies often have weaknesses related to variable specification and the inability to ask qualitative questions. Surveys also offer considerable versatility and flexibility in asking a wide variety of questions. Additionally, surveys provide a direct way for outsiders to understand how companies operate. Thus, they permit identifying where theoretical concepts fall short in addressing practical issues in corporate decision making, which in turn helps identify future research opportunities. Finally, using a survey enables researchers to choose the volume of data to collect and the degree of complexity depending on the scope of information requirements and resource availability.

As Chu and Partington (2001, p. 166) note, "the availability of large computerized databases has been a boon to researchers by freeing them from much of the tedium of data collection and management." Yet, such availability of data has caused researchers to become distanced from their data and accept it without question. The risk of uncritical acceptance of data may lead the researcher to erroneous conclusions. Chu and Partington further note that this problem is compounded in multi-country studies because a single researcher is unlikely to have the knowledge across all countries of conditions and institutional detail that helps identify anomalous data and results.

Several important results emerge from this survey-based study. In line with finance theory, the evidence shows a strong preference for NPV followed by IRR and PBP. By contrast, Jog and Srivastava (1995) report in their 1991 survey that IRR and PBP dominate the NPV method. The results also differ from studies showing that IRR in the United States and PBP in Europe are the most popular capital budgeting techniques. Among the capital budgeting techniques, the survey results show that using real options is even less popular in Canada than in the United States and Europe. Canadian managers indicate that the main reason for not using real options is the lack of expertise or knowledge. Clearly this finding is contrary to the optimistic predictions from the academic and professional community about the prospective widespread use of real options as a powerful capital budgeting and management tool.

Regarding risk analysis, the study documents that Canadian managers rely mainly on subjective judgment, which is inconsistent with theory. Subjectivity also applies when adjusting the discount rate for risk, forecasting project cash flows and estimating the cost of equity capital. These findings diverge markedly from the approaches used by U.S. and European financial managers when dealing with risk in capital budgeting.

In examining capital structure choice, the results of the survey provide support for trade-off theory relative to pecking order theory. Further, Canadian managers exhibit tighter target capital structure than their U.S. and European counterparts. Finally, the results indicate that firm size and CEO education influence corporate finance decisions.

The remainder of the paper proceeds as follows. Section II discusses the research methodology and describes the survey sample. Section III discusses potential limitations of the survey approach while Section IV presents and discusses the main findings. Section V provides an explanation of the differences between U.S. and Canadian survey results regarding corporate finance practices. Finally, Section VI provides a summary and conclusions.

II. Research Methodology and Sample Selection

A. Survey Design

A mail survey serves as the major means of gathering data. The survey is available from the authors upon request. Previous survey studies especially Graham and Harvey (2001) provide the inspiration for the current study. The current survey contains two groups of questions. The first group focuses on capital budgeting methods, cost of capital, and capital rationing and the second group consists of questions on real options. The questionnaire concludes by inquiring about the backgrounds of respondents including their involvement in their firm's capital budgeting process and current position. Survey recipients are also asked whether the company's CEO holds an MBA degree.

For most questions in the first group, survey recipients are asked to indicate how frequently they use each of the capital budgeting and cost of capital techniques provided in the survey using a five-point Likert scale where 0 = never, 1 = rarely, 2 = sometimes, 3 = often, and 4 = always. A t-test is used for the null hypothesis that the mean response for each method equals 0 (never).

The section on real options contains six questions: The first two questions ask respondents to indicate the reason(s) underlying their use of real options. The first question asks whether their company uses real options in making capital budgeting decisions. The second question provides six reasons and asks respondents to indicate the level of importance of each reason on a four-point scale where 1 = none, 2 = low, 3 = moderate, and 4 = high. The third question is an open-ended question asking respondents to state the most important reason for their firm using real options.

The section on real options ends with two questions on why their company does not use real options. In one question, eight reasons are provided and respondents are asked to choose one or more based on the four-point importance scale where 1 = none, 2 = low, 3 = moderate, and 4 = high. The last question is an open-ended question asking respondents to specify the most important reason for not using real options.

B. Sample Description

The initial survey sample consisted of all 847 Canadian firms listed on Toronto Stock Exchange (TSX) at the beginning of 2006. To be included in the final survey sample, each firm had to have the following data available from the Stock-Guide database: (1) revenues, (2) debt-to-equity ratio, and (3) price-to-book ratio. Instead of using Worldscope and Compustat, Stock-Guide is used because this specialized database provides more comprehensive coverage of Canadian public firms and leads to a larger sample size. Such data is used to test for differences between responding and non-responding firms. Deleting firms with missing data resulted in a final sample of 762 firms.

On February 5, 2006, a personalized cover letter requesting participation in this study along with a stamped self-addressed return envelope and the two-page survey instrument was mailed to the chief financial officer (CFO) of each of the 762 firms. The names and addresses of the CFOs were obtained from each company's website. The cover letter stated that if recipients are not actively involved in determining their firm's capital budgeting decision, they should give the survey to someone in their company who is involved. The survey contained a code number to avoid potentially including duplicate responses in the analysis.

The cover letter informed potential respondents that the results

TABLE 1. Characteristics of Survey Respondents and Non-Respondents for TSX-Listed Firms

	Market Value of Equity (Cdn$ millions)	Total Assets (Cdn$ millions)	Revenues (Cdn$ millions)	Beta	Ownership (%)	Voting (%)	Debt-to -Equity Ratio	Price-to -Book Ratio
Mean								
Respondents	1954.20	3514.73	973.37	0.78	32.95	37.01	0.28	2.82
Non-respondents	1838.36	4009.56	1145.20	0.87	28.32	33.76	0.34	2.78
Median								
Respondents	438.85	358.82	214.95	0.70	26.40	31.60	0.21	2.35
Non-respondents	205.86	290.20	80.12	0.78	24.45	28.85	0.19	2.02
Standard deviation								
Respondents	4799.24	6945.33	1965.50	0.41	25.29	29.03	0.39	2.09
Non-respondents	5965.61	8759.94	3288.55	0.54	24.66	27.70	1.08	2.83
Number of respondents	211	214	214	199	189	189	214	214
Number of non-respondents	542	548	548	501	476	476	548	548
t-test for the equality of means								
Equality of variances (assumed)	0.19	–0.85	–0.71	–1.20	1.63	1.13	–0.60	0.13
Equality of variances (not assumed)	0.23	–1.52	–1.17	–1.59	1.60	1.06	–1.18	0.17
Wilcoxon test	16989.5	18808.5	14832.3	9349.4	10156.2	10345.4	9322.1	19351.6

(*Continued*)

TABLE 1. (Continued)

Note: For the TSX-listed firms surveyed, this table provides descriptive statistics for 214 responding and 548 non-responding firms on eight characteristics. The Stock-Guide database serves as the source for obtaining the following data on each of the two groups for year 2005: (1) market value of equity, (2) total assets, (3) revenues, (4) beta, (5) ownership, (6) voting, (7) debt-to-equity ratio, and (8) price-to-book ratio. Market value of equity, total assets and revenues are in millions Canadian dollar (Cdn$ millions). Ownership is the total percentage of equity interest held as a group by the company's directors and by other individuals or companies that own more than 10% of the company's equity shares. Voting is the total percentage of votes attached to the company's voting shares held by the company's directors and by other individuals or companies that own more than 10% of the equity shares of the company, and/or exercise control over more than 10% of all voting rights. The voting right refers to the right of a common stockholder to vote, in person or by proxy, for members of the board of directors and other matters of corporate policy. To determine if the responding and non-responding firms differ significantly on each characteristic, a t-test is used to test for the equality of means assuming equal variances and non-equal variances. The non-parametric Wilcoxon test is also used. The number of respondents and non-respondents is less than full survey sample (762) because of missing observations. No statistically significant differences exist between respondent and non-respondent firms on any characteristic at the 0.05 level.

would be in summary form and would not be disclose any information about individual companies. Although including a code number may have reduced the response rate and/or introduced a response bias, having the ability to identify duplicate responses outweighs this potential limitation. A second copy of the survey was mailed to non-respondents on March 31, 2006 to increase the response rate and thereby to reduce potential non-response bias. As an inducement to increase the response rate, an executive summary of the results was offered to all interested parties.

By the end of April 2006, 214 usable responses (a 28.1% response rate), consisting of 159 responses from the first mailing and 55 responses from the second mailing, were received. A usable response was defined as one in which a participant answered at least 90% of the questions. The response rate is considerably higher than similar survey-based studies including Trahan and Gitman (1995), Jog and Srivastava (1995), Graham and Harvey (2001), and Brounen, De Jong, and Koedijk (2004) with 12%, 23%, 9%, and 5% response rates, respectively.

Of the respondents, 89.5% report being actively involved in their firm's capital budgeting process. The most common positions or titles of the respondents are CFO (87.3%), vice president of finance (3.9%), and corporate controller (3.6%). The remaining respondents belong to one of the following categories, where no category amounts to more than 3% of the responses: CEO, corporate secretary, and president. In summary, the sample represents high ranking and knowledgeable corporate executives. Of the participants, 20.6% indicate that their company's CEO holds an MBA degree.

The responses to the survey come from managers of firms in the following business sectors: manufacturing (44%), retail and wholesale sales (24%), and mining (14%). The remaining business sectors (financial, high-tech, and utility) each represent less than 10% of the responses. Thus, the sample includes a wide range of industries.

Table 1 provides descriptive statistics for respondent and non-respondent firms. The data suggest that the firm characteristics of the two groups are similar. The difference in means test, which is discussed in the next section, supports this assertion. The mean firm size of respondent (non-respondent) firms, measured in terms of market value of equity is about 1,954 (1,838) million Canadian dollars. Firm beta is about 0.78 and 0.87 for the respondent and non-respondent firms, respectively. Both groups exhibit a high level of ownership concentrations with an average around 30%. A similar observation applies to the leverage (debt-to-equity) ratio. Finally, both respondent and non-respondent firms have an average price-to-book ratio of about 2.8.

III. Potential Limitations of the Survey Approach

As with any survey, this study has several potential limitations. First, non-response bias could affect the results despite taking several steps to reduce this bias such as using multiple mailings, assuring respondents of confidentiality, and making the survey reasonably short and easy to complete. The high response rate relative to other recent surveys lessens this concern. Nevertheless, the study examines non-response bias by testing whether the means of eight firm characteristics of the 214 responding firms differ significantly from those of the 548 non-responding firms. The firm characteristics are: (1) market value of equity, (2) total assets, (3) revenues, (4) beta, (5) ownership, (6) voting, (7) debt-to-equity ratio, and (8) price-to-book ratio. A t-test is used to determine whether a significant difference exists between the means of the respondents and non-respondents on each firm characteristic. Because the standard t-test assumes equality of variances, which may not be the case, a t-test that does not assume equality of variances is also used. Because t-tests assume a normal distribution, which also may not be the case, a further test for non-response bias using a non-parametric test, specifically the Wilcoxon test, is used. The results for equality of means, reported in table 1, show that no significant difference exists between firms of respondents and non-respondents on any of the eight characteristics at conventional levels.

As suggested by Wallace and Mellor (1988), the responses from the 159 firms that returned the survey after the first mailing are compared to those responses from the 55 firms after the second mailing. To perform the chi-square tests and to reduce the potential problem associated with small cell size, the five-point scale is collapsed to three categories – (1) never and rarely, (2) sometimes, and (3) often and always – and the four-point importance scale to two categories – (1) none and low and (2) moderate and high. The chi-square tests (not reported here but available from the authors upon request) show no significant differences between the responses to the first and second mailing at normal levels.

Besides non-response bias, the survey questionnaire may be the source of other potential limitations. Did respondents answer each question truthfully? Did respondents properly understand the questions? Do the responses to each question depend on the question's location in the survey? There is no evidence that respondents answered untruthfully or misunderstood the questions. Because all statements appear in one section on a single page, any potential bias based on question location appears small. The literature contains many instances of order having no effect on response rates such as Graham and Harvey (2001).

IV. Results and Discussion

A. Capital Budgeting Techniques

The study begins by examining whether Canadian public firms use DCF methods to evaluate investment opportunities. Consistent with theory, the vast majority (84%) of the respondents indicate that they use DCF techniques. Results presented in figure 1 also show that 58% use DCF techniques as a primary tool while about 26% use them as a secondary tool. Not surprisingly, DCF methods are more popular among larger firms and firms managed by CEOs with an MBA.

As table 2 shows, firms use DCF techniques mainly to help in deciding whether to expand in terms of new operations. The second and third most popular situations in which firms tend to use DCF techniques are mergers and acquisitions (M&As) and expansion of existing operations. The results from the chi-square tests suggest that firm size and CEO education affect the popularity of DCF techniques. Consistent with figure 1, larger firms are more likely to use DCF methods in four of the seven situations presented in table 2, except expansion (new and existing operations) and M&As where the chi-square test is not statistically significant. Approaches using DCF are also more popular in firms managed by CEOs with an MBA when such firms face decisions involving the expansion of existing operations, project replacement, and foreign operations.

Managers of Canadian firms generally appear to assess the riskiness of capital projects consistent with financial theory. First, the results from Panel A of figure 2 show that 84% of the respondents indicate that they differentiate between the riskiness of capital projects. This tendency is more pronounced in firms managed by CEOs with an MBA but does not seem to be influenced by firm size. Second, the results

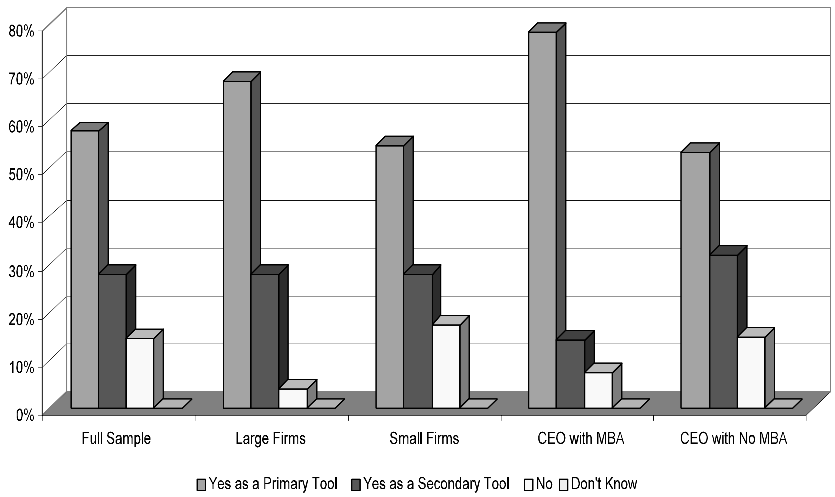


FIGURE 1.— Use of Discounted Cash Flow Techniques to Evaluate Investment Opportunities

Note: This figure provides the responses by managers of Canadian firms on whether their firms use DCF techniques to evaluate investment opportunities. The participants chose one answer among the following choices: (1) Yes as a primary tool, (2) Yes as a secondary tool, (3) No, and (4) Don't know. The figure partitions the sample by firm size (large and small) and by whether or not the firm's CEO holds an MBA.

from Panel B show that nearly 83% of respondents indicate that they measure project risk individually, while only 16% specify that they group projects into risk classes. This view is more pronounced for small firms (i.e., firms that have sales less than 100 million Canadian dollars) and firms managed by CEOs without an MBA. As Panel C shows, 44% of the responding managers indicate that they adjust the discount rate, 23% adjust the cash flow, and 26% adjust both the discount rate and the cash flow to account for the project riskiness. Firms managed by CEOs with an MBA are more likely to adjust the discount rate or cash flow than firms managed by CEOs without an MBA. The latter are more likely to adjust both.

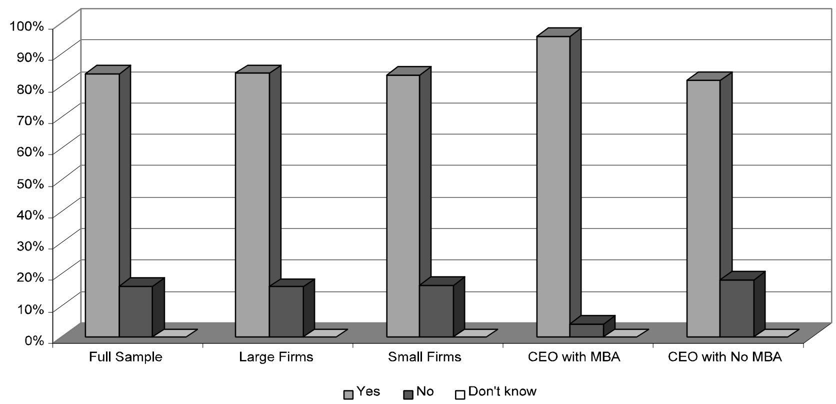
In a 1991 survey of large Canadian firms, Jog and Srivastava (1995) report that the four most popular DCF techniques are IRR, NPV, PBP, and ARR. Their survey results suggest that IRR (in most cases) and PBP (in several cases) dominate the NPV method. The three other techniques (NPV, IRR, and PBP) always dominate the ARR. As table 3 shows, the

TABLE 2. Use of DCF Techniques in Various Situations

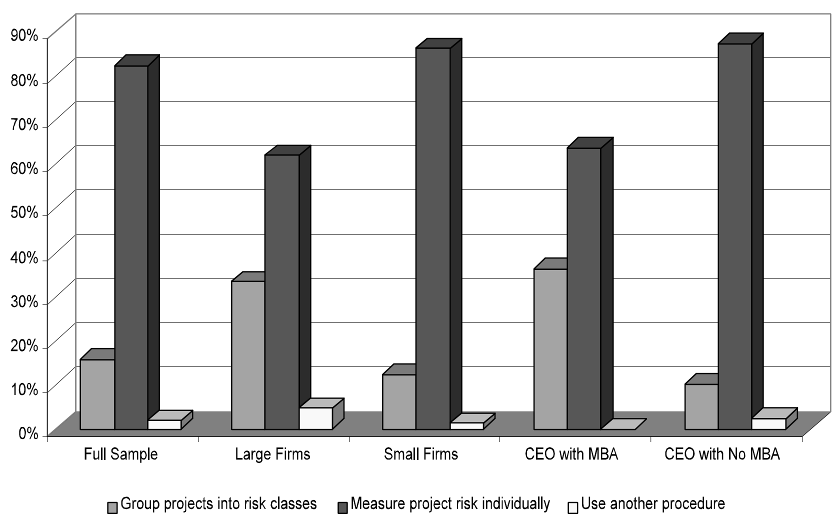
			Response Mean				
				Firm Size		CEO with an MBA	
S#	Statement	% of Often or Always	Full Sample	Large	Small	Yes	No
3	Expansion – new operations	89.9	3.45	3.95	3.11	3.95	3.33
4	Mergers and acquisitions	88.8	3.51	3.75	3.39	3.95	3.45
2	Expansion – existing operations	81.8	3.24	3.63	3.01	3.99	2.98*
1	Replacement projects	54.5	2.45	3.23	2.13**	3.31	2.17*
7	Leasing	49.4	2.16	2.97	1.83*	2.84	1.99
6	Abandonment	41.8	1.85	2.96	1.45**	2.84	1.55
5	Foreign operations	43.9	1.78	2.68	1.47*	2.68	1.58*

Note: This table provides the responses by managers of Canadian firms on whether their firms often or always use DCF techniques in seven different situations. Respondents indicate the frequency level based on a five-point scale where 0 = never, 1 = rarely, 2 = sometimes, 3 = often, and 4 = always. The table partitions the sample by firm size (large and small) and by whether or not the firm's CEO holds an MBA. *, ** indicate significance at the 0.05 and 0.01 levels, respectively.

A. Survey responses on whether their firms differentiate between the riskiness of capital projects



B. Survey responses on whether firms group projects into risk classes, measure project risk individually, or use another procedure



C. Percent of respondents using different approaches to adjust for project riskiness

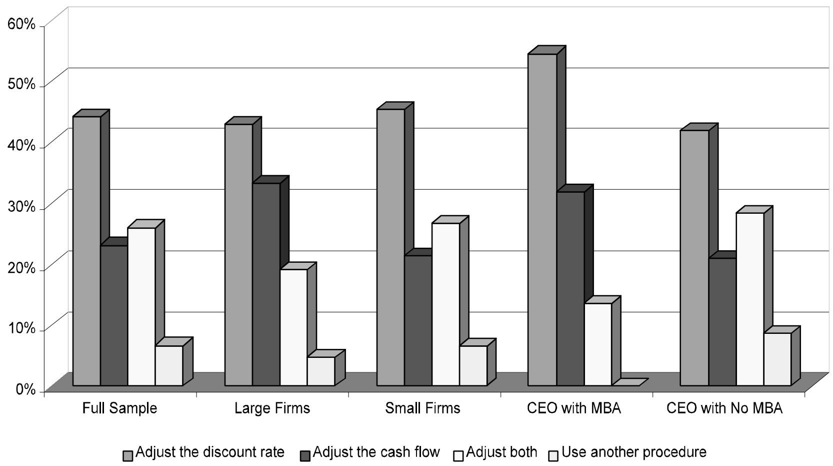


FIGURE 2.— Assessing Risk of Capital Budgeting Projects by Canadian Firms

Note: This figure provides the responses on how Canadian managers assess the riskiness of capital projects. Each figure partitions the sample by firm size (large and small) and by whether or not the firm's CEO holds an MBA.

updated survey, which includes both small and large firms, provides new insights on the capital budgeting techniques used by Canadian firms. Although, IRR, NPV, PBP, and ARR remain the most popular techniques, the evidence shows that consistent with finance theory NPV is the most popular method. In fact, nearly 75% of respondents indicate that they often or always use NPV, while about 68% and 67% often or always use IRR and PBP, respectively. Slightly less than 40% claim to use ARR often or always. While firm size or CEO education does not appear to influence the frequency of using NPV, IRR seems to be more popular in large firms. Hence, Jog and Srivastava's evidence reflects mainly the capital budgeting practices of large firms and should not be generalized to all Canadian firms.

The results also differ from recent U.S. and European evidence where IRR seems to be the most popular technique in the United States (Graham and Harvey, 2001) and PBP is the most frequently used capital budgeting technique in France, Germany, the Netherlands, and the

TABLE 3. Capital Budgeting Techniques Used by Canadian Firms When Deciding which Projects or Acquisitions to Pursue

			Response Mean				
				Firm Size		CEO with an MBA	
S#	Statement	% of Often or Always	Full Sample	Large	Small	Yes	No
4	Net present value	74.6	2.93	2.92	2.95	3.04	2.88
7	Internal rate of return	68.4	2.81	3.40	2.52**	3.14	2.70
2	Payback period	67.2	2.78	3.04	2.73	2.63	2.98*
1	Accounting rate of return	39.7	1.76	2.04	1.67	1.36	1.82
3	Discounted payback	24.8	1.18	0.61	1.34*	0.68	1.29*
5	Adjusted present value	17.2	0.90	1.04	0.88	0.82	0.91
6	Profitability index	11.2	0.53	0.32	0.60	0.29	0.60
8	Modified internal rate of return	12.0	0.52	0.40	0.53	0.01	0.72**
9	Real options	10.4	0.47	0.68	0.35*	0.11	0.63*

Note: This table presents the responses by managers of Canadian firms on which capital budgeting techniques their firms use when deciding which projects or acquisitions to pursue. Respondents indicate the frequency level based on a five-point scale where 0 = never, 1 = rarely, 2 = sometimes, 3 = often, and 4 = always. The table partitions the sample by firm size (large and small) and by whether or not the firm's CEO holds an MBA. *, ** indicate significance at the 0.05 and 0.01 levels, respectively.

TABLE 4. Risk Analysis Techniques Used by Canadian Firms When Deciding the Projects or Acquisitions to Pursue

			Response Mean				
				Firm Size		CEO with an MBA	
S#	Statement	% of Often or Always	Full Sample	Large	Small	Yes	No
4	Judgment	76.9	3.11	3.36	3.00	3.22	3.11
1	Sensitivity analysis	73.5	2.90	3.08	2.88	3.14	2.88
2	Scenario analysis/Decision trees	31.9	1.56	1.72	1.55	1.36	1.61
8	Change the required return	27.5	1.29	1.86	1.11*	1.59	1.25
3	Simulation analysis	12.9	0.84	1.00	0.77	0.68	0.86
9	Measure risk in a portfolio context	13.1	0.76	1.08	0.67	0.95	0.73
6	Adjust the payback period	8.6	0.66	0.43	0.72*	0.36	0.72
5	Mathematical programming	4.3	0.40	0.55	0.28**	0.14	0.47
7	Certainty equivalents	0.9	0.22	0.20	0.23	0.09	0.24

Note: This table presents the responses of managers of Canadian firms on which risk analysis techniques their firms use when deciding which projects or acquisitions to pursue. Respondents indicate the frequency level based on a five-point scale where 0 = never, 1 = rarely, 2 = sometimes, 3 = often, and 4 = always. The table partitions the sample by firm size (large and small) and by whether or not the firm's CEO holds an MBA. *, ** indicate significance at the 0.05 and 0.01 levels, respectively.

United Kingdom (Brounen, De Jong, and Koedijk (2004). Although the popularity of PBP has decreased over time, the method still enjoys wide usage especially among firms whose CEO does not hold an MBA. For example, consistent with Graham and Harvey, the results of the current study find that the use of payback is more popular in firms managed by CEOs who do not hold an MBA.

Of the nine capital budgeting techniques used by Canadian firms, the use of real options is the least popular technique. As table 3 shows, only 10.4% of the respondents report using real options often or always. Yet, larger firms and those managed by CEOs without an MBA appear to use real options more frequently. Although the latter finding appears counterintuitive, a potential explanation is that because MBA programs often focus more on traditional techniques with less coverage of real options, CEOs holding an MBA may be more likely to favor traditional approaches. Jagannathan and Meier (2002) link this behavior to the social desirability hypothesis developed in the psychology literature.

Table 4 presents survey responses regarding nine risk analysis techniques used by Canadian firms when deciding which projects or acquisitions to pursue. Contrary to finance theory, the most common is judgment, which 76.9% of the respondents report using often or always, followed closely by sensitivity analysis (73.5%), and scenario analysis/decision-tree analysis (31.9%). Not surprisingly, only a small percentage report using mathematical programming (4.3%) and certainty equivalents (0.9%) often or always.

B. Cost of Capital, Capital Structure, and Capital Rationing

Table 5 presents information on how frequently the responding firms use various discount rates when evaluating a new project. Consistent with finance theory, the majority of the companies (63.6%) report using the company's overall discount rate (weighted average cost of capital or WACC) often or always. Using WACC appears more popular among large firms, which is consistent with the view that large firms tend to use more sophisticated approaches (Graham and Harvey, 2001). The second most popular alternative (43.5%) relies on management's experience followed by the cost of specific funds planned for financing the project (38.2%). Only 36.6% of respondents indicate using a risk-matched discount rate often or always, while 14.1% report employing a different discount rate for each cash flow that has a different risk characteristic.

TABLE 5. Discount Rates Used by Canadian Firms When Evaluating a New Project

			Response Mean				
				Firm Size		CEO with an MBA	
S#	Statement	% of Often or Always	Full Sample	Large	Small	Yes	No
1	The company's overall discount rate (weighted average cost of capital).	63.6	2.44	2.80	2.35*	2.30	2.46
4	A rate based on management's experience.	43.5	1.80	1.76	1.84	1.12	1.92*
2	The cost of specific funds planned for financing the project.	38.2	1.70	1.72	1.70	1.05	1.97**
5	A risk-matched discount rate for this particular project.	36.6	1.63	1.80	1.55	1.50	1.69
6	A different discount rate for each cash flow that has a different risk characteristic.	14.1	0.85	1.21	0.77	0.86	0.87
3	A divisional discount rate (if the product line of business matches a division).	11.3	0.59	0.98	0.45**	0.41	0.65

Note: This table presents the responses by managers of Canadian firms on how their firms select a discount rate when evaluating a new project. Respondents indicate the frequency level based on a five-point scale where 0 = never, 1 = rarely, 2 = sometimes, 3 = often, and 4 = always. The table partitions the sample by firm size (large and small) and by whether or not the firm's CEO holds an MBA. *, ** indicate significance at the 0.05 and 0.01 levels, respectively.

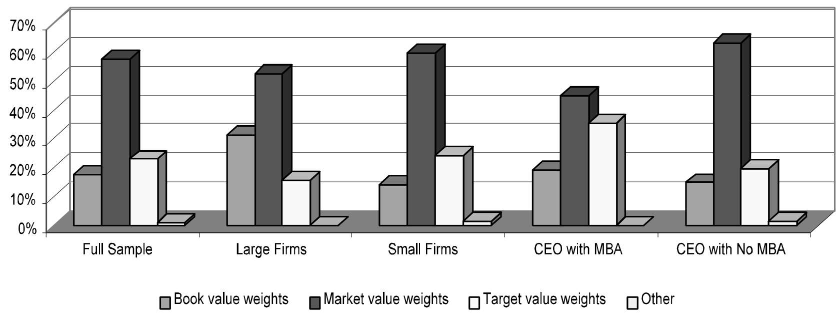


FIGURE 3.— Weighting Schemes Used by Canadian Firms to Compute Their WACC

Note: This figure provides the responses by Canadian firms on which weighting scheme their firms use to compute WACC. The figure partitions the sample by firm size (large and small) and by whether or not the firm's CEO holds an MBA.

Given that the majority of respondents report using their firm's WACC to evaluate new projects, respondents are asked to identify the weighting scheme used to calculate WACC. As figure 3 shows, in line with finance theory, the majority of the companies (57.7%) use market value weights to get WACC. Surprisingly, however, the use of market value weights is more popular in small firms and firms managed by CEOs without an MBA. The second most popular weighting scheme for calculating WACC is target value weights (23.1%) followed by book value weights (18.0%).

As figure 4 shows, about 75% of the respondents indicate that their companies estimate the cost of equity capital, a result that seems consistent with theory. Large firms and those managed by CEOs holding an MBA are more likely to estimate the cost of equity capital. For those corporations that estimate their cost of equity capital, respondents are asked to indicate how they make their estimates from 10 choices. In contrast to finance theory, table 6 indicates that managers of Canadian firms tend to rely more on subjective judgment than on formal models when computing the cost of equity capital. In fact, 60.3% of respondents report using judgment often or always, compared to 52.3% using the cost of debt plus an equity premium. This evidence contrasts with their counterparts in the United States and Europe. For example, although the CAPM is the most popular technique in the United States (Graham and Harvey, 2001) and Europe (Brounen, De Jong, and Koedijk, 2004), only

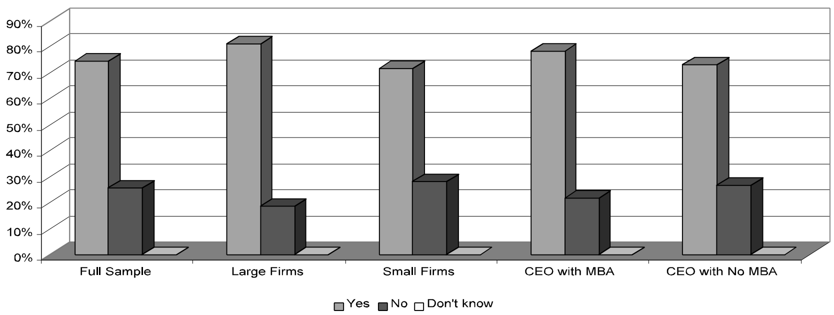


FIGURE 4.— Canadian Firms Reporting Whether They Estimate the Cost of Equity Capital

Note: This figure presents the responses by managers of Canadian firms on whether their firms estimate the cost of equity capital. The figure partitions the sample by firm size (large and small) and by whether or not the firm's CEO holds an MBA.

36.8% of Canadian firms indicate using it often or always. The use of judgment is more pronounced in small firms while the CAPM is more popular in large firms. This evidence is consistent with the capital budgeting literature suggesting that small firms tend to use less sophisticated methods when setting their cost of capital (Brounen, De Jong, and Koedijk, 2004).

The use of subjective judgment by Canadian executives does not seem to be limited to computing the cost of equity capital and risk analysis but also to how they forecast project cash flows. In fact, table 7 shows that 94.0% of the respondents indicate a moderate or high reliance on management's subjective judgment in forecasting future cash flows, while 70.1% use quantitative methods, and 42.7% rely on consensus of experts' opinion. Neither firm size nor CEO education (holding an MBA) appears to affect these results.

The survey also examines the level of support for two competing theories of capital structure in a Canadian context, namely, static trade-off theory and pecking order theory. Trade-off theory suggests that a firm sets a target capital structure that reflects its trade off between the costs and benefits associated with debt. The pecking order theory of Myers and Majluf (1984) predicts that a firm does not have a target capital structure and finances new projects using retentions first followed by debt and then equity issues.

One way to directly test which capital structure theory is likely to

TABLE 6. How Canadian Firms Estimate the Cost of Equity Capital

			Response Mean				
				Firm Size		CEO with an MBA	
S#	Statement	% of Often or Always	Full Sample	Large	Small	Yes	No
1	Judgment	60.3	2.33	2.01	2.64**	2.39	2.30
5	Cost of debt plus equity risk premium	52.3	2.01	1.85	2.08	1.89	2.07
3	Capital asset pricing model (CAPM)	36.8	1.52	1.96	1.12*	2.36	1.13**
6	Earnings/price (E/P) ratio	21.8	1.02	0.53	1.20*	0.83	1.09
9	Based on what our investors tell us they require	20.0	1.00	0.85	1.07	1.56	0.76*
8	Average historical returns on common stock adjusted for risk	14.1	0.81	0.46	0.93**	0.94	0.79
7	Accounting return on equity	17.5	0.73	0.74	0.73	0.22	0.88*
2	Dividend growth model (dividend yield plus an estimate of growth)	12.9	0.66	0.48	0.74	0.44	0.73
4	Multi-factor asset pricing model	7.1	0.33	0.19	0.40	0.33	0.33
10	By regulatory decisions	5.9	0.29	0.19	0.34	0.01	0.38

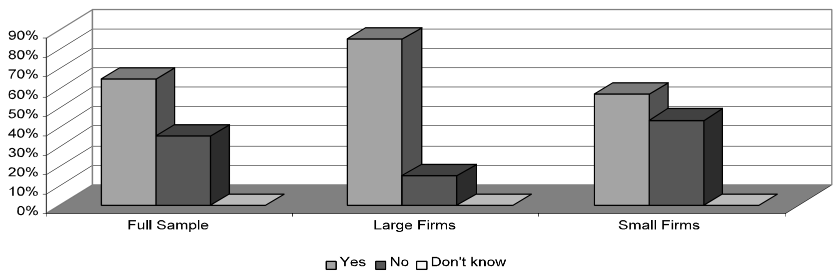
Note: This table presents the responses by managers of Canadian firms on how their firms estimate their cost of equity capital. Respondents indicate the frequency level based on a five-point scale where 0 = never, 1 = rarely, 2 = sometimes, 3 = often, and 4 = always. The table partitions the sample by firm size (large and small) and by whether or not the firm's CEO holds an MBA. *, ** indicate significance at the 0.05 and 0.01 levels, respectively.

TABLE 7. Methods Used by Canadian Firms to Forecast Project Cash Flows

			Response Mean				
				Firm Size		CEO with an MBA	
S#	Statement	% of Moderate or High	Full Sample	Large	Small	Yes	No
1	Management's subjective judgment	94.0	3.49	3.58	3.46	3.46	3.50
3	Quantitative methods	70.1	2.88	2.89	2.88	3.04	2.84
2	Consensus of experts' opinions	42.7	2.32	2.42	2.29	2.17	2.37

Note: This table shows the responses by managers of Canadian firms on the level of importance that their firms attach to several methods of forecasting project cash flows. Respondents indicate the level of importance of each reason on a four-point scale where: 1 = none, 2 = low, 3 = moderate, and 4 = high. The table partitions the sample by firm size (large and small) and by whether or not the firm's CEO holds an MBA. None of the differences between firm size and CEO education is significant at the 0.05 level.

A. Survey responses to the question: "Does your firm have a target capital structure (debt-to-equity ratio)?"



B. Survey responses to the question: "If 'Yes', what type of target debt ratio does your firm have?"

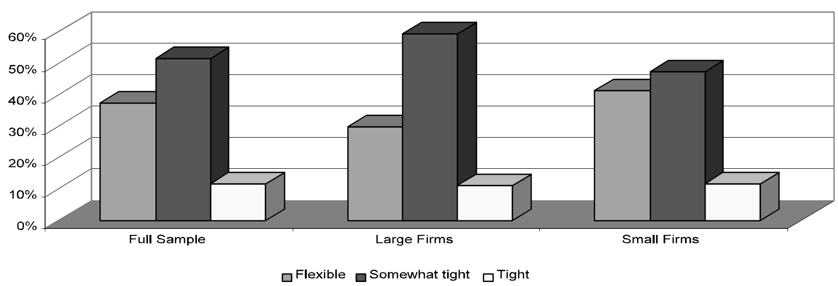


FIGURE 5.— Canadian Firms Reporting a Target Capital Structure

Note: This figure reports the responses by managers of Canadian firms on whether their firms have a target capital structure in Panel A and the degree of flexibility of their capital structure in Panel B. The figure partitions the sample by firm size (large and small).

hold for Canadian firms is to examine the percentage of firms having a target capital structure. According to the results presented in Panel A of figure 5, the majority (65%) of the respondents indicate that their firms have a target capital structure, which provides support for static trade-off theory. The percentage is smaller than that reported by Graham and Harvey (2001) and Brounen, De Jong, and Koedijk (2004) for the United States (83%), the Netherlands (75%), Germany (71%). Still, the percentage is higher than the rate for the United Kingdom (60%) and France (43%).

Panel B of figure 5 presents the results on the degree of flexibility of a firm's target capital structure: flexible, somewhat tight, and tight. Unlike U.S. and European firms, the majority (53%) of the Canadian firms have a somewhat tight target. A tight target capital structure is the least popular with only about 12% of respondents claiming this type of structure. Compared with smaller firms, a greater percentage of larger firms indicate a somewhat tight target debt ratio (60% versus 47%) but a lower percentage have a flexible target (30% versus 41%).

Respondents are also asked to indicate, to the nearest 10%, the percentage of time that their firms face capital rationing (i.e., have more acceptable projects than funds available to invest). The survey results indicate that the mean percentage is 40%. Compared with large firms, small firms are more likely to face capital rationing (43% versus 34%, respectively).

C. Real Options

As Baldwin (1987, p. 61) noted more than two decades ago "given the increase in variability in both product and financial markets worldwide, companies that recognize option values and build a degree of flexibility into their investments are likely to be at a significant advantage in the future, relative to companies that fail to take account of options in the design and evaluation of capital projects." Considering the current economic and financial turmoil, Baldwin's vision is more relevant today than ever. Unlike DCF techniques, real options enable firms to cope with high levels of uncertainty and allow for high levels of flexibility. Thus, real options potentially offer a more efficient way for managers to allocate their firm's capital and maximize shareholder value. Graham and Harvey (2001) find that 27% of their respondents report that their firms use real options. In fact, this approach ranks eighth among 12 capital budgeting techniques considered in their study.

The survey results indicate that real options are even less popular in Canada. As table 3 shows, using real options is the least popular approach among the nine capital budgeting techniques presented in the survey. When asked whether their company uses real options in making capital budgeting decisions 17% answer "yes," 79% respond "no", and 4% indicate "don't know." Thus, only 36 of the 214 respondents report that their firms use real options, while 169 indicate that their firms do not use real options. As expected, the real options approach is employed mainly by firms in industries characterized by large capital investments and considerable uncertainty and flexibility: mining (38.9%), oil and gas (16.7%), biotechnology (13.9%), and pharmaceuticals (11.1%).

To gain further insight about real options, the 36 respondents from

TABLE 8. Why Canadian Firms Use Real Options in Making Capital Budgeting Decisions

			Response Mean				
				Firm Size		CEO with an MBA	
S#	Statement	% of Moderate or High	Full Sample	Large	Small	Yes	No
6	Provides a management tool to help form the strategic vision	85.0	3.35	3.65	3.21*	3.67	3.29
1	Incorporates managerial flexibility into the analysis	83.4	3.06	2.80	3.15	3.20	3.06
5	Provides a way of thinking about uncertainty and its effect on valuation over time	82.0	3.05	2.60	3.20	3.33	3.00
2	Complements traditional capital budgeting techniques	65.0	2.85	2.60	2.93	2.47	2.98**
4	Provides an analytical tool to deal with uncertainty	65.0	2.75	2.60	2.80	3.43	2.45**
3	Provides a long-term competitive advantage through better decision making	60.0	2.65	2.60	2.67	2.67	2.65

Note: For Canadian firms using real options in making capital decisions, this table presents the importance that their firms place on six reasons for using these real options. Respondents indicate the level of importance of each reason on a four-point scale where: 1 = none, 2 = low, 3 = moderate, and 4 = high. The table partitions the sample by firm size (large and small) and by whether or not the firm's CEO holds an MBA. The sample size is 36. *, ** indicate significance at the 0.05 and 0.01 levels, respectively.

TABLE 9. Why Canadian Firms Do Not Use Real Options

			Response Mean				
				Firm Size		CEO with an MBA	
S#	Statement	% of Moderate or High	Full Sample	Large	Small	Yes	No
1	Lack of expertise or knowledge	77.9	3.27	2.86	3.55**	3.78	3.10**
5	Too complex to apply in practice	38.0	2.02	2.00	2.02	1.78	2.07
4	Lack of applicability to our business	36.6	2.01	1.64	2.24*	1.40	2.25*
3	Difficulty of estimating inputs	31.6	1.83	1.81	1.83	1.78	1.84
2	Requires unrealistic assumptions	28.3	1.72	1.59	1.77	1.56	1.76
7	Does not help managers make better decisions	27.2	1.71	1.59	1.75	1.50	1.76
8	Limited support for real-world applicability of real options models	26.2	1.69	1.70	1.69	1.59	1.72
6	Requires many internal resources	21.7	1.66	1.56	1.71	1.72	1.65

Note: This table reports the responses by managers of Canadian firms on the reasons that their firms do not use real options. Respondents indicate the level of importance of each reason on a four-point scale where: 1 = none, 2 = low, 3 = moderate, and 4 = high. The table partitions the sample by firm size (large and small) and by whether or not the firm's CEO holds an MBA. The sample size is 169. *, ** indicate significance at the 0.05 and 0.01 levels, respectively.

firms already employing real options are asked to indicate the importance of six reasons for using this approach in making capital budgeting decisions. As table 8 shows, at least 60% of these respondents view all six reasons for using real options as of moderate to high importance. The most important reason is that real options provide a management tool to help form the strategic vision. The next most highly ranked reasons for using real options are that they incorporate managerial flexibility into the analysis and provide a way of thinking about uncertainty and its effect on valuation over time.

Using an open-ended question, respondents are asked to state the most important reason for using real options. Based on 11 responses, the most common reasons are that real options tie closely to the true pace of business activities, challenge historical perspectives, fit a rational strategic planning model, and present an informal means to improve understanding and perspective.

As the survey indicates, the level of popularity of real options among Canadian firms appears relatively low, especially given the purported advantages associated with them compared to traditional techniques. Thus, managers of firms not using real options are asked to indicate the importance of eight reasons for not using them. As table 9 shows, the overwhelming reason for not using real options is the lack of expertise or knowledge. In fact, 77.9% of the respondents indicate that this reason is of moderate to high importance. The next most important reasons for not using real options concern their complexity and inapplicability.

Using an open-ended question, respondents are asked to indicate the major reason for their firms not using real options. Based on 29 responses, the evidence shows that these responses are consistent with the results reported in table 9. Representative responses to the open-ended question are: “What are real options?”, “Don’t know enough about it, but don’t feel it’s necessary”, “We feel that it is not widely accepted yet in our industry”, “Don’t take time to understand them”, “Never been exposed to it”, “Never considered it”, “Our decision making process works great, no desire to change”, and “We are comfortable with our capital budgeting approach”.

V. Explaining the Difference between U.S. and Canadian Survey Results

Several studies document that institutional differences influence corporate decision-making (Rajan and Zingales, 1995, 2003; La Porta et al., 1998; Aggarwal et al., 2009), which, in turn, may lead to country differences in corporate finance practices. Although the United States and Canada have well-developed equity markets, some important differences between these markets may explain why the survey results diverge between the two countries.

A. Difference in Corporate Governance and Ownership Structure

According to Brounen, De Jong, and Koedijk (2004), firms that attempt to maximize shareholder value are likely to use advanced and theoretically correct capital budgeting techniques. This finding is consist with La Porta et al. (1998) and others who stress that corporate governance and ownership structure determine whether insiders' (managers and controlling shareholders) main objective is to maximize minority shareholders wealth or to extract private benefit of control.

The United States and Canada differ in several features of ownership structure and corporate governance. Morck, Strangeland, and Yeung (2001, p. 327) assert that these economies "have broadly similar factor endowments, and employ virtually identical technology and human capital in similar institutional frameworks" except for their ownership structure. Ownership is highly concentrated in Canadian public firms but widely diffused in U.S. public firms. In Canada, a small group of large blockholders, or affiliated groups of investors, dominate the ownership scene. Wealthy families maintain some influence over public officials through different control mechanisms such as pyramidal holdings, cross holdings, and multiple class shares. In fact, Morck, Strangeland, and Yeung (2001) find that 254 of the 500 largest Canadian companies represent privately-held firms. The remaining 246 are public firms of which only 53 have broad ownership. Attig and Gadhoum (2003) extend Morck, Strangeland, and Yeung's (2001) analysis and find that more than 80% of all Canadian public firms have controlling shareholders with 40% controlled by wealthy family groups. Attig and Gadhoum also report that 33% of public firms are controlled through pyramidal structures while 16% are controlled through shares with superior voting rights. More recently, in a sample of 263 Canadian firms, Klein, Shapiro, and Young (2005) find 123 widely-held firms, and 140 closely-held firms, of which 84 are family-owned.

Recent allegations of corporate wrongdoings in Canada such as Hollinger Inc. and Royal Group Technologies Inc. typify the use of control pyramids and multiple-class shares in expropriating minority shareholders. These governance failures allegedly involved related-party transactions and large fund transfers in the form of management agreements and improper “non-compete” fees from affiliated firms to their ultimate owners. In fact, many Canadian firms also use a dual-class share structure (Amoako-Adu and Smith, 1995; Attig, 2005; King and Segal, 2009). For instance, King and Segal document that about 20% of Canadian public firms have dual-class shares. Clearly, the corporate ownership and control structure in Canada differs substantially from the freestanding, widely-held firm prototype customary in the United States and the United Kingdom.

Furthermore, while the U.S. corporate governance regime is mandatory, the Canadian regime is largely voluntary (Anand, 2005). Anand, Milne, and Purda (2006), who examine the governance practices of Canadian firms listed on the Toronto Stock Exchange from 1999 to 2003, find that the presence of an executive blockholder or a majority shareholder is negatively associated with voluntary adoption of the corporate governance regime.

Moreover, various empirical studies suggest that Canadian corporate governance is weaker than that in the United States (Jabbour, Jalilvand, and Switzer, 2000; McNally and Smith, 2003). Bris (2005), for example, argues that Canada ranks behind the United States with respect to law enforcement, mandatory disclosure, illegal insider trading, and other aspects of regulatory regime. King and Segal (2003) examine why equity of Canadian-listed firms trades at a discount to equity of Canadian firms cross listed on both a Canadian and a U.S. stock exchange. The authors show that the valuation discount is due to the weaker corporate governance in Canada relative to the United States.

The higher concentration of ownership in Canadian firms coupled with a relatively weak Canadian corporate governance system may exacerbate managerial opportunism, which in turn could result in not using corporate finance practices that maximize minority shareholders’ value. Consistent with this view Athanassakos (2007) shows that the lack of value-based management in Canada helps to explain the underperformance of the Canadian stock market during the 1990s relative to the United States.

B. Firm Size

The results suggest that Canadian managers rely more on subjective judgment than other methods when adjusting their discount rate, analyzing risk, forecasting project cash flow, and estimating the cost of equity capital. This finding differs markedly from the widespread use of the CAPM by U.S. firms. Canadian managers are also less likely to use real options. These differences could be due to the smaller size, on average, of Canadian firms relative to U.S. firms (Leung, Meh, and Terajima, 2008). In fact, Graham and Harvey (2001), among others, document fundamental differences between large and small firms when analyzing corporate finance practices. Specifically, they report that smaller firms tend to use less sophisticated methods, which is consistent with Canadian firms relying more on subjective judgment rather than using more analytical or sophisticated approaches.

VI. Summary and Conclusions

This study uses a survey to investigate financial practices of Canadian firms involving capital budgeting, cost of capital estimation, capital structure, and real options. What are the major findings from this study? Consistent with finance theory, the findings on capital budgeting practices show a strong preference for NPV followed by IRR and PBP. In contrast to theory, Canadian managers, however, rely mainly on subjective judgment when dealing with risk analysis and to a slightly lesser extent on sensitivity analysis.

The survey also examines the approach that Canadian firms use to incorporate differential project risk into their analysis. Although responding firms tend to differentiate between the riskiness of capital projects as recommended by finance theory, they rely mainly on subjective risk assessments in adjusting the discount rate. The majority of respondents use a WACC based on market value weights as an appropriate discount rate when evaluating an average risk project. The use of subjective judgment by Canadian managers also applies both to forecasting project cash flows and to estimating the cost of equity capital. This latter finding contrasts with the widespread use of the CAPM by U.S. and European firms. In examining capital structure choice, the evidence finds support for the trade-off theory relative to pecking-order theory.

Contrary to the optimistic predictions from the academic and professional community, the use of real options appears disproportionate to its potential as a powerful capital budgeting and management tool. The evidence shows that the major reason for firms not using real options is the lack of expertise and knowledge rather than the features and design of real options.

Finally, the evidence indicates that both firm size and CEO education influence some corporate finance practices. For example, large firms and firms managed by CEOs with an MBA tend to use more sophisticated techniques when evaluating new projects and when estimating the cost of equity capital. The study also documents that large firms are more likely to use real options but that real options are less popular in firms managed by CEOs with an MBA.

What are the implications of the findings for practitioners and academics? Taken together, the findings show that despite improvements in finance practices in Canada over time, more effort is needed to encourage Canadian firms, particularly small ones, to use more objective approaches and to take greater advantage of real options analysis. Using sub-optimal approaches is likely to negatively influence firm value and hence stock price performance as discussed by Athanassakos (2007).

The study also shows that "one size does not fit all" involving corporate finance practices. Important institutional and other differences exist between countries and in such areas as corporate governance, ownership structure, and firm size. Because such differences could influence managerial decisions about which finance practices they use, researchers need to consider them.

Another implication of the study involves the use of real options. The survey evidence provides support for Triantis (2005) who calls for academic research that integrates practitioners' concerns about applying real options to real world cases. Triantis (p. 16) notes, "Academics must listen carefully to the critiques of practitioners and allow them to influence the kinds of problems that are addressed in academic research. To the extent that we can be responsive to the concerns of practitioners, and improve the normative models we offer them, real options will have the type of profound impact that we have long been expecting, but which has not yet been realized." Because the low popularity of real options among Canadian managers is mainly due to a lack of expertise and knowledge, business schools have the opportunity to place greater emphasis on this powerful tool in their MBA and other programs.

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Written Evidence of Dr. Cleary filed in the 2023 Alberta Generic Cost of Capital Proceedings

Exhibit AX

How Do Investors Compute the Discount Rate? They Use the CAPM

(Corrected June 2017)

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We provide guidance to corporate managers and investors on how to select the discount rate when evaluating investment opportunities. When making corporate investment decisions on behalf of the equity investors in a firm, an obvious choice is to use the method that equity investors use in making their own investment decisions. We infer how investors compute the discount rate by looking at mutual fund investors' capital allocation decisions. We find that investors adjust for risk by using the beta of the capital asset pricing model (CAPM). Extensions to the CAPM perform poorly, implying that investors do not use these models to compute discount rates.

Editor's Note: The original version had a production error in Table 2, which has been corrected in this version.

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Arguably, the most important tool in business decision making is valuing future cash flow streams by using the present value criterion. Without this valuation technique, making routine investment decisions would be difficult. Given this criterion's importance, it is surprising how little consensus there is in the field of finance on one of its crucial inputs: the discount rate. Because there is no generally accepted standard, investors must make the choice themselves. Unfortunately, the choice set runs a gamut of possible risk models, from simply ignoring risk to using complicated multifactor models. How should practitioners make this choice?

One way practitioners can find guidance is to observe what other people are doing. For example, one could consult surveys, such as Graham and Harvey (2001), who interviewed chief financial officers. These surveys generally find that practitioners use the capital asset pricing model (CAPM).[1] By their very nature, however, surveys suffer from two important limitations. First, it is unclear whether the sample of surveyed investors is representative. Second, one can never be sure whether the people surveyed actually put their money where their mouth is.

In our study, we took a different tack. Rather than using survey data, we measured what a large set of investors actually do, and from those data, we inferred which risk model they use. Specifically, we observed the investment decisions of mutual fund investors and show that these decisions are most consistent with the hypothesis that they use the CAPM. Because mutual fund investors represent a very large fraction of all investors (in 2013, 81% of households with an annual income over $100,000 invested in mutual funds), we argue, on the basis of this evidence, that using the CAPM to compute the discount rate is state of the art.

The idea behind our test is to apply the principles that the investment and academic communities use to explain the behavior of stock prices. It is widely accepted that investors compete fiercely with each other for attractive investment opportunities. For example, as soon as news about a company is released, the price adjusts very quickly to reflect that new information. Thus, the expected return that an investor earns by investing in a stock after the public information is released is not influenced by that news. Rather, the stock's expected return is solely a reflection of the stock's riskiness. Put differently, as soon as an attractive trading opportunity presents itself, investors submit orders in an attempt to profit from the opportunity, thereby driving the price up or down. In the end, the equilibrium price (the price that clears the market) is set so the expected return is commensurate with the risk of owning the stock. Because these orders are the mechanism that determines the equilibrium price, they reveal investors' risk preferences. Simply put, if an investor submits a buy order after a news announcement, the investor believes that the stock is cheap or, equivalently, that the expected return is higher than the *risk-adjusted* expected return. Thus, we can use these orders to infer something about the risk model that investors are using.

To implement this idea in our study, we needed to observe two quantities. First, we needed to observe a news announcement that resulted in an attractive investment opportunity. Second, we needed a way to measure how investors respond to such opportunities. Fortunately, both quantities are easily observable for mutual funds. When a mutual fund manager outperforms on a risk-adjusted basis (the news), investors will revise upward their assessment of that manager's skill, creating an attractive investment opportunity they will want to take advantage of. The subsequent capital flow into the mutual fund is the equivalent of the buy orders for stocks and thus reveals investors' risk preferences.

Method

To make these ideas concrete, let us revisit how the mutual fund market reaches equilibrium.[2] Because mutual fund managers do not have an infinite number of investment ideas, their outperformance deteriorates as more money is allocated to them. So, if investors perceive that a fund offers a positive net alpha, they will want in on the fund and will shower it with money. This inflow of capital will drive the return down and will cease only when investors no longer perceive that they can earn an extra return. Similarly, if investors perceive that a fund is underperforming (i.e., has a negative net alpha), they will withdraw capital, thereby raising the fund's return. The outflow will cease only when the net alpha is zero—that is, when, in equilibrium, the net alpha of all funds, as with stocks, is driven to zero.

Let us now consider what happens, in equilibrium, when a new piece of information arrives. The most important piece of information investors use to assess a fund manager's skill is the return the manager achieves. If the fund earns a high abnormal return, investors will positively update their estimate of the fund manager's skill, implying that investors' expectations for the risk-adjusted expected return (the fund's net alpha) will rise above zero. Earlier, we discussed what happens to the price of a stock when good news is revealed: The stock price rises to reflect the good news. How does that work for mutual funds? Because the price of a mutual fund cannot adjust (after all, the fund's price is merely the net asset value and thus cannot change to reflect the manager's skill), the equilibrium adjustment will happen in quantities; that is, the size of the fund will change. Funds will flow in until the net alpha is again zero. A similar mechanism occurs when a fund's abnormal return is low; in that case, funds flow out. In summary, a fund's realized return is the news that reveals attractive investment opportunities. The subsequent flow of capital is how investors respond to such opportunities.

So, how do investors decide whether a realized abnormal return is high or low? They decide by comparing the realized return with the return predicted by the risk model. If the realized return exceeds the return predicted by the risk model (a positive abnormal return), investors conclude that the manager has outperformed and invest capital in the fund. If the realized return is less than what the risk model predicted, investors conclude that the manager has underperformed and withdraw capital from the fund. We can thus infer which risk model investors are using by finding which model best explains capital flows.

We now describe in detail the test that we performed. First, we selected a set of risk models that are often used in the literature. For each of these models and for each time period, we determined which funds outperformed and which funds underperformed relative to that model. Next, we observed the flows into and out of these funds. The model for which performance best lines up with subsequent capital flows is the model closest to what investors actually use when adjusting for risk.

In our study, we computed for every risk model the fraction of times we observed an inflow when the fund's realized return exceeded the risk-adjusted return and the fraction of times we observed an outflow when the fund's realized return was less than the risk-adjusted return. Our measure of the fit of a particular model was the average of these two fractions. In Berk and van Binsbergen (2016b), we showed that this average can also be estimated by running a simple linear regression of the sign of flows against the sign of outperformance. This approach is preferable because, as we showed in the same paper, the *t*-statistic of this regression is an accurate measure of statistical significance. In particular, if the coefficient from using one risk model statistically significantly exceeds the coefficient from using a second risk model, we can say that the first model is closer to the risk model investors are actually using.

Results

The dataset that we used, from Berk and van Binsbergen (2015), covered January 1977–March 2011. We removed funds with less than five years of data, resulting in a total of 4,275 funds.[3] In Berk and van Binsbergen (2015), we crosschecked the CRSP and Morningstar databases, which allowed us to overcome several important shortcomings of both databases (see the appendix in that paper for more details about this extensive data project).

Moreover, we had to address two practical issues before we could proceed with our test. First, we needed to define what a flow actually is. A fund's assets under management (AUM) change for two reasons: Either the prices of the underlying stocks change, or investors invest or withdraw capital. Although both mechanisms change AUM, they are unlikely to affect the fund's alpha equally. For example, increases in fund size that result from inflation are unlikely to affect the fund's alpha-generating process. Similarly, the alpha-generating process is unlikely to be affected by changes in fund size that result from changes in the price level of the market as a whole. Consequently, in our empirical specification, we considered only capital flows into and out of funds net of what would have happened if investors had not invested or withdrawn capital and the fund manager had adopted a purely passive strategy and invested in Vanguard index funds. Thus, we measured the flow of funds as

$$\mathrm{SIGN}\left[q_{it} - q_{i,t-T}\left(1 + R_{it}^{V}\right)\right], \tag{1}$$

where q_{it} is the size of fund *i* at time *t*, and R_{it}^{V} is the cumulative return (over the horizon $t - T$ to t) to investors of the collection of available Vanguard index funds that comes closest to matching the fund being considered. Under this definition of capital flows, we assumed that in making their capital allocation decisions, investors consider changes in fund size resulting from returns that are due to managerial outperformance alone. That said, all our results are robust to replacing R_{it}^{V} with the fund's own return in Equation 1.

The second practical issue that we had to address was the horizon length over which to measure the effects. For most of our sample, funds reported their AUM monthly. In the early part of the sample, however, many funds reported their AUM only quarterly. To avoid introducing a selection bias by dropping these funds, the shortest horizon we considered was three months. If investors react to new information immediately, flows should respond to performance immediately, and the appropriate horizon for measuring the effect is the shortest horizon possible. There is evidence, however, that some investors do not respond immediately. For this reason, we also considered longer horizons (up to four years). The downside of using longer horizons is that they tend to put less weight on investors who update immediately, and these investors are also more likely to be marginal in setting prices.

In our study, we considered an array of risk models. Because the market portfolio is unobservable, we tested two versions of the CAPM that correspond to two different market proxies: the CRSP value-weighted index of stocks and the S&P 500 Index. We also tested the factor models proposed by Fama and French (1993), hereafter the FF factor specification, and Carhart (1997), hereafter the FFC factor specification. In addition, we considered three "no model" benchmarks. The first uses the actual return of the fund, which corresponds to investors using no model at all. The second uses the return of the fund in excess of the risk-free return; risk-neutral investors would use this measure of risk. In the third model, the performance of the fund is simply the fund's return minus the return of the market (as measured by the CRSP value-weighted index). Investors *ignore beta* in this model; all they care about is outperformance relative to the market.

Which model best approximates the true asset-pricing model? **Table 1** reports the averages of the fractions of times we observed an inflow when the fund's realized return exceeded the risk-adjusted return and the fractions of times we observed an outflow when the fund's realized return was less than the risk-adjusted return. If flows and outperformance are unrelated, we would expect this average to equal 50%. The first takeaway from Table 1 is that none of our candidate models can be rejected outright,[4] implying that regardless of the risk adjustment, a flow–performance relationship exists. But none of the models perform better than 64%. Apparently, a large fraction of flows remains unexplained. Investors seem to be using other criteria to make a nontrivial fraction of their investment decisions.

Importantly, the CAPM with the CRSP value-weighted index as the market proxy performs best at all horizons. To assess whether the difference

Table 1. Relationship of Flow of Funds and Outperformance, 1977–2011

	Horizon					
Model	3 Months	6 Months	1 Year	2 Years	3 Years	4 Years
Market models (CAPM)						
CRSP value weighted	**63.63%**	**63.49%**	**63.38%**	**64.08%**	**63.86%**	**63.37%**
S&P 500	62.52	62.26	61.61	62.20	61.40	60.92
No model						
Return	58.55%	59.77%	57.72%	59.76%	60.83%	61.20%
Excess return	58.29	59.64	57.57	60.91	61.27	61.69
Return in excess of market	62.08	61.99	61.19	62.45	62.05	61.76
Multifactor models						
FF	63.14%	62.84%	63.05%	63.62%	63.59%	62.43%
FFC	63.25	62.92	63.09	63.59	63.46	62.35

Notes: This table reports the averages of the fractions of times we observed an inflow when the fund's realized return exceeded the risk-adjusted return and the fractions of times we observed an outflow when the fund's realized return was less than the risk-adjusted return. Each row corresponds to a different risk model. The first two rows report the results for the market model (CAPM) with the CRSP value-weighted index and the S&P 500 Index as the market portfolio. The next three rows report the results for using as the benchmark return three rules of thumb: (1) the fund's actual return, (2) the fund's return in excess of the risk-free rate, and (3) the fund's return in excess of the market return as measured by the CRSP value-weighted index. The last two rows report the results for the FF and FFC factor specifications. The largest value in each column is shown in boldface.

in performance between the CAPM and the other models is statistically significant, we report in **Table 2** the double-clustered (by fund and time) *t*-statistics.[5] No model statistically significantly outperforms the CAPM at any horizon.

To assess the relative performance of the models, we can begin by first focusing on the behavioral model in which investors simply react to past returns without adjusting for risk—the column marked "Ret." in Table 2. Looking down that column, we can see that the factor models all statistically significantly outperform this model at horizons of less than two years. For example, the *t*-statistic of the CAPM outperforming this no-model benchmark at the three-month horizon is 4.98, indicating that we can reject the hypothesis that the behavioral model is a better approximation of the true model than is the CAPM. On the basis of these results, we can reject the hypothesis that investors simply react to past returns.

The next possibility is that investors are risk neutral. In an economy with risk-neutral investors, we would find that the excess return (the difference between the fund's return and the risk-free rate) best explains flows, so the performance of this model can be assessed by looking at the column labeled "Ex. Ret." Note that all the risk models nest this model, and thus to conclude that a risk model better approximates the true model, the risk model must statistically significantly outperform this model. For horizons of less than two years, all the risk models satisfy this criterion. Finally, we could hypothesize that investors benchmark their investments relative to the market portfolio alone; that is, they do not adjust for any risk differences (beta) between their investment and the market. The performance of this model is reported in the column labeled "Ex. Mkt." The CAPM statistically significantly outperforms this model at all horizons; investors' actions reveal that they use betas to allocate resources.

Our method can also be used to discriminate between the different risk models. Note that the CAPM is the first factor in both the FF and the FFC factor specifications, implying that the CAPM is nested in these models. Thus, to conclude that either factor model better approximates the true model, it must statistically significantly outperform the CAPM. We report the results for this hypothesis in Table 2 (the column labeled "CAPM"). Neither factor model statistically significantly outperforms the CAPM at any horizon, suggesting that the additional factors add no explanatory power for flows. Indeed, as Table 1 shows, the CAPM outperforms all extensions to the model at all horizons.

It is also informative to compare the tests of statistical significance across horizons. The ability to discriminate statistically among the models deteriorates as the horizon increases. This finding is what we would expect if investors instantaneously moved capital in response to the information in realized returns. Thus, this evidence is consistent with the idea that capital does in fact move quickly to attractive investment opportunities.

We demonstrated that these results are robust in Berk and van Binsbergen (2016b). There, we restricted the sample to post-1995 data and showed that the results are consistent: No model statistically significantly outperforms the CAPM. We also dropped small outperformance deviations that might not be worth responding to (because of transaction costs) and found the same results.

Implications for Practitioners

Our results have a number of important practical implications—beyond the main implication that mutual fund investors use the CAPM to make their investment decisions. First, the CAPM is useful to financial practitioners in determining the discount rate for capital-budgeting decisions. When practitioners make investment decisions on behalf of the equity investors in a firm, an obvious choice is to use the method the equity investors use in making their investment decisions. Our results imply that if practitioners wish to implement the rule their equity investors use, they should use the CAPM to compute the discount rate.

Second, that the factor models do worse than the CAPM suggests that investors do not see the additional factors as risk factors. When the factors outperform the CAPM, investors respond with additional capital, implying that they interpret

Table 2. Tests of Statistical Significance

Model	Prob.	Univ. *t*-Statistic	CAPM	FFC	FF	CAPM S&P 500	Ex. Mkt.	Ret.	Ex. Ret.
A. Three-month horizon									
CAPM	63.63%	26.35	0.00	1.15	1.52	4.71	7.28	4.98	5.77
FFC	63.25	28.64	−1.15	0.00	0.65	1.69	3.16	4.42	5.13
FF	63.14	28.45	−1.52	−0.65	0.00	1.42	2.76	4.35	5.07
CAPM S&P 500	62.52	21.25	−4.71	−1.69	−1.42	0.00	1.25	3.97	4.62
Excess market	62.08	22.46	−7.28	−3.16	−2.76	−1.25	0.00	3.40	3.95
Return	58.55	10.72	−4.98	−4.42	−4.35	−3.97	−3.40	0.00	1.18
Excess return	58.29	10.11	−5.77	−5.13	−5.07	−4.62	−3.95	−1.18	0.00

Model	Prob.	Univ. *t*-Statistic	CAPM	FFC	FF	CAPM S&P 500	Ex. Mkt.	Ret.	Ex. Ret.
B. Six-month horizon									
CAPM	63.48%	21.11	0.00	1.08	1.23	3.24	4.64	2.63	3.17
FFC	62.92	21.21	−1.08	0.00	0.35	0.95	1.47	2.21	2.64
FF	62.84	22.40	−1.23	−0.35	0.00	0.79	1.38	2.09	2.49
CAPM S&P 500	62.26	14.21	−3.24	−0.95	−0.79	0.00	0.50	1.78	2.09
Excess market	61.99	16.03	−4.64	−1.47	−1.38	−0.50	0.00	1.47	1.73
Return	59.77	8.44	−2.63	−2.21	−2.09	−1.78	−1.47	0.00	0.32
Excess return	59.64	8.26	−3.17	−2.64	−2.49	−2.09	−1.73	−0.32	0.00

Model	Prob.	Univ. *t*-Statistic	CAPM	FFC	FF	CAPM S&P 500	Ex. Mkt.	Ret.	Ex. Ret.
C. One-year horizon									
CAPM	63.38%	13.54	0.00	0.44	0.47	3.89	6.42	2.25	2.98
FFC	63.09	14.30	−0.44	0.00	0.18	1.63	2.39	2.17	2.79
FF	63.05	14.55	−0.47	−0.18	0.00	1.47	2.25	2.11	2.67
CAPM S&P 500	61.61	8.31	−3.89	−1.63	−1.47	0.00	0.54	1.69	2.15
Excess market	61.18	10.38	−6.42	−2.39	−2.25	−0.54	0.00	1.26	1.60
Return	57.72	4.10	−2.25	−2.17	−2.11	−1.69	−1.26	0.00	0.17
Excess return	57.57	4.00	−2.98	−2.79	−2.67	−2.15	−1.60	−0.17	0.00

Model	Prob.	Univ. *t*-Statistic	CAPM	FF	FFC	Ex. Mkt.	CAPM S&P 500	Ex. Ret.	Ret.
D. Two-year horizon									
CAPM	64.08%	12.80	0.00	0.80	0.97	5.73	3.81	1.45	1.42
FF	63.62	16.17	−0.80	0.00	0.13	1.86	1.57	1.37	1.37
FFC	63.59	16.46	−0.97	−0.13	0.00	2.06	1.72	1.31	1.33
Excess market	62.45	10.89	−5.73	−1.86	−2.06	0.00	0.36	0.70	0.89
CAPM S&P 500	62.20	8.16	−3.81	−1.57	−1.72	−0.36	0.00	0.60	0.84
Excess return	60.91	7.09	−1.45	−1.37	−1.31	−0.70	−0.60	0.00	1.22
Return	59.76	5.99	−1.42	−1.37	−1.33	−0.89	−0.84	−1.22	0.00

(continued)

Table 2. Tests of Statistical Significance (continued)

Model	Prob.	Univ. *t*-Statistic	CAPM	FF	FFC	Ex. Mkt.	CAPM S&P 500	Ex. Ret.	Ret.
E. Three-year horizon									
CAPM	63.85%	13.86	0.00	0.51	1.04	4.90	3.53	1.24	1.11
FF	63.59	14.39	−0.51	0.00	0.43	2.54	2.41	1.21	1.09
FFC	63.46	14.42	−1.04	−0.43	0.00	2.67	2.55	1.07	0.98
Excess market	62.05	9.93	−4.90	−2.54	−2.67	0.00	0.84	0.37	0.46
CAPM S&P 500	61.40	8.05	−3.53	−2.41	−2.55	−0.84	0.00	0.05	0.19
Excess return	61.27	6.91	−1.24	−1.21	−1.07	−0.37	−0.05	0.00	0.51
Return	60.83	5.85	−1.11	−1.09	−0.98	−0.46	−0.19	−0.51	0.00

Model	Prob.	Univ. *t*-Statistic	CAPM	FF	FFC	Ex. Mkt.	Ex. Ret.	Ret.	CAPM S&P 500
F. Four-year horizon									
CAPM	63.37%	13.02	0.00	1.81	1.95	4.76	0.79	0.90	3.93
FF	62.43	11.77	−1.81	0.00	0.37	1.11	0.38	0.57	1.62
FFC	62.35	11.61	−1.95	−0.37	0.00	0.96	0.32	0.50	1.58
Excess market	61.76	9.70	−4.76	−1.11	−0.96	0.00	0.04	0.24	1.26
Excess return	61.69	7.20	−0.79	−0.38	−0.32	−0.04	0.00	0.52	0.32
Return	61.20	6.37	−0.90	−0.57	−0.50	−0.24	−0.52	0.00	0.11
CAPM S&P 500	60.92	7.30	−3.93	−1.62	−1.58	−1.26	−0.32	−0.11	0.00

Notes: The first column reports the averages of the fractions of times we observed an inflow when the fund's realized return exceeded the risk-adjusted return and the fractions of times we observed an outflow when the fund's realized return was less than the risk-adjusted return. The second column shows the *t*-statistics for the tests of whether these averages are significantly different from 50%. The other columns report the statistical significance of the pairwise tests of whether the models are better approximations of the true asset-pricing model. For each model in a column, the table displays the *t*-statistic for the test of whether the model in the row is a better approximation of the true asset-pricing model. The rows and columns are ordered by the probabilities in the first column, with the best-performing model on top. All *t*-statistics are double clustered by fund and time (see Thompson 2011).

this outperformance as evidence of alpha, not as compensation for additional risk.

Third, it is well known that the CAPM does not describe the cross section of expected returns very well. This empirical result implies one of three things. First, it could imply that the profession has simply not found the correct risk model yet, that a risk model will eventually be discovered that better explains the cross section of expected returns. In that case, the neoclassical paradigm that a stock's expected return is only a function of its risk is the right paradigm. Second, perhaps expected returns and risk are simply unrelated. In that case, it is important to identify other non-risk-based factors that drive the cross section of expected returns. The third possibility is a combination of the first two: Both risk-based and non-risk-based factors drive the cross section of expected returns. Our study provides insight into the question of which of these three possibilities is most likely.

Because the factor models in our study statistically significantly outperformed the "no model" case, the second possibility is not particularly likely. Thus, the open question is whether the CAPM's inability to describe the cross section of expected returns is due to (1) the existence of a superior risk model or (2) the fact that non-risk-based factors drive expected returns. To conclude that a better risk model exists, we must show that the part of the variation in asset returns not explained by the CAPM is unrelated to flows. If it *is* related to flows, investors perceive this variation in asset returns as alpha, not as compensation for risk. Therefore, any factor that is proposed because it explains this variation must also not drive flows if it is to be considered a measure of risk.

Conclusion

The main contribution of this article is to provide guidance to financial practitioners in selecting the discount rate when evaluating investment opportunities. We have demonstrated that among a range of proposed models, the CAPM—though perhaps far from being a perfect model of risk—is most consistent with investor behavior. Thus, if the criterion for deciding how to compute the discount rate is to use the method investors use, practitioners should use the CAPM.

Editor's Note

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Notes

1. The CAPM was developed independently by Treynor (1962), Sharpe (1964), Lintner (1965), and Mossin (1966).
2. See Berk and Green (2004); Berk and van Binsbergen (2016a, 2016b).
3. We chose to remove these funds to ensure that incubation flows would not influence our results. Changing the criterion to two years does not change our results.
4. The second column in Table 2 reports the double-clustered (by fund and time) *t*-statistics under the null hypothesis that flows and performance are unrelated.
5. The rows and columns in Table 2 are ordered by the probabilities in the first column, with the best-performing model on top, which explains why the order of Table 2's rows and columns differs from the order in which they are discussed in the text.

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Written Evidence of Dr. Cleary filed in the 2023 Alberta Generic Cost of Capital Proceedings

Exhibit AY

1. Long-Term Asset Returns
(Corrected June 2017)

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This chapter summarizes the long-run global historical evidence on the returns from stocks, bonds, bills, and exchange rates, all adjusted for inflation, over the 116 years since 1900. It updates and expands the data originally published in our 2002 book, Triumph of the Optimists. *Given that returns are volatile, long-run historical data are important for understanding security returns and long time series are needed both to reduce measurement errors and to span the broadest possible range of historical market conditions.*

The Dimson–Marsh–Staunton (DMS) Dataset

Our database of annual returns (DMS 2016c) has expanded to cover 23 countries from the beginning of 1900 to the beginning of 2016. It comprises annual returns for stocks, bonds, and bills, plus inflation and exchange rates. It now covers two North American markets (the United States and Canada), ten markets from the Eurozone (Austria, Belgium, Finland, France, Germany, Ireland, Italy, the Netherlands, Portugal, and Spain), six European markets that are outside the Eurozone (Denmark, Norway, Russia, Sweden, Switzerland, and the United Kingdom), four Asia-Pacific markets (Australia, China, Japan, and New Zealand), and one African market (South Africa). As of the start of 2016, these countries make up 92% of the investable universe for a global investor, based on free-float market capitalizations. Our database also includes three global indices (World, World ex-USA, and Europe) denominated in a common currency (US dollars). The equity indices are weighted by market capitalization, and the bond indices are weighted by GDP.

General Methodology

The DMS database is based on the best-quality capital appreciation and income series available for each country, drawing heavily on previous studies and existing sources. Where possible, data are taken from peer-reviewed academic papers or highly rated professional studies that are listed in DMS (2002, 2007, 2016b). Many of the underlying studies are also listed by Annaert, Buelens, and Riva (2016). We update these studies by linking their return series to the best, most comprehensive commercial return indices available. To span the entire period from 1900, we link multiple index series. The best index is chosen for each period, switching when feasible to better alternatives as they become available. Other factors equal, we have chosen equity indices that afford the broadest coverage of their market. The DMS series are all total return series, including reinvested income (dividends for stocks; coupons for bonds).

The creation of the DMS database was in large part an investigative and assembly operation. Most of the series already existed, but some were long forgotten, unpublished, or came from research in progress. In other cases, the task was to estimate total returns by linking dividends to existing capital gains indices. For several countries, there were periods when no adequate series existed. In these cases, we compiled our own indices from archival records of the underlying securities. A detailed description of the sources used for each country, together with references to the multitude of researchers to whom we are indebted and whose studies we have drawn on, is provided in the *Global Investment Returns Sourcebook* (DMS 2016b).

The DMS series all start in 1900, a common start date that facilitates international comparisons. Data availability and quality dictated this choice of start date, and for practical purposes, 1900 was the earliest plausible start date for a comparative international database with broad coverage (see DMS 2007).

Every one of the 23 countries experienced market closures at some point, typically during wartime. However, in all but two cases, it is possible to bridge these interruptions and construct an investment returns history that spans the closure period. For 21 countries, therefore, we have a complete 116-year history of investment returns. For Russia and China, market closure was followed by expropriation of investors' assets, so we have market returns only for the pre- and post-communist eras. We incorporate these returns into the world and regional indices, showing a total loss on both Russian and Chinese stocks and bonds at the start of the communist eras. A brief history for each market is included in DMS (2016a).

Then and Now

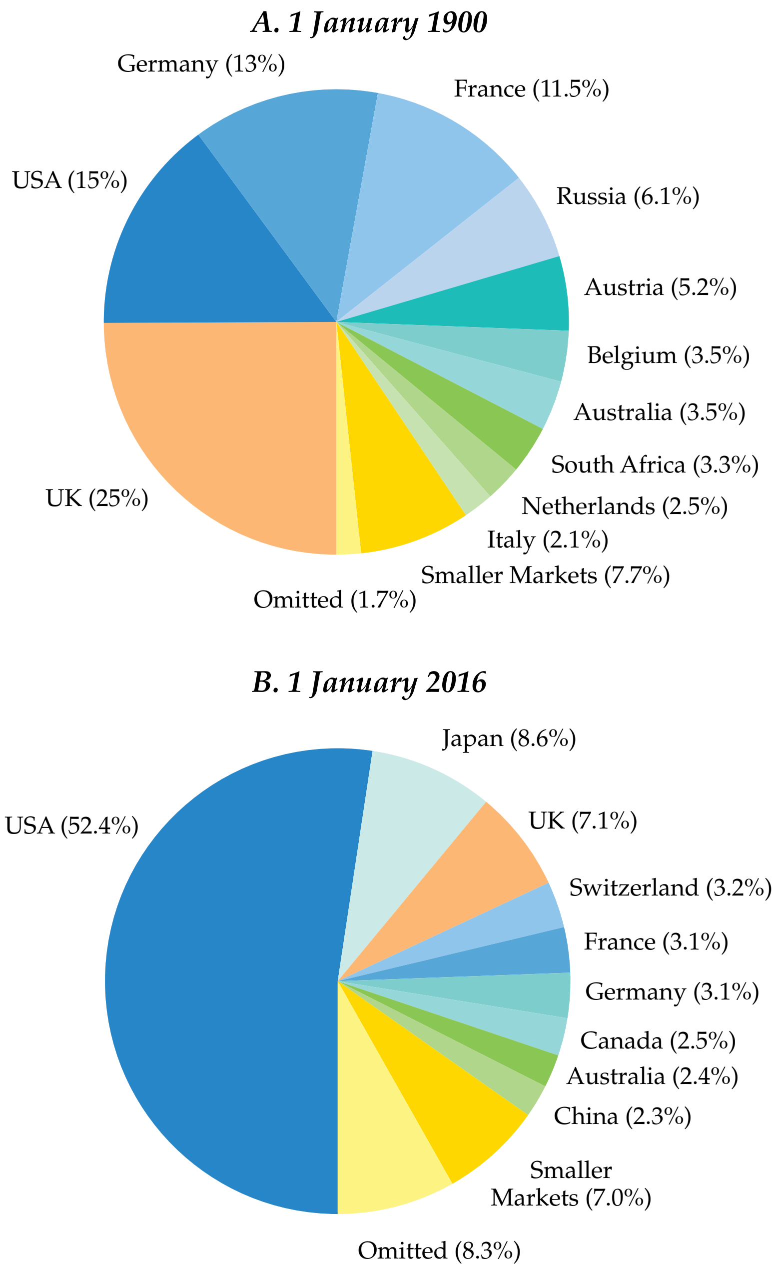
Figure 1.1 shows the relative sizes of world equity markets at our starting date of New Year's Day 1900 (Panel A) and how they had changed by 2016 (Panel B). Panel B is based on free-float market capitalizations within the FTSE All-World Index and hence shows the investable universe for a global investor. Note that emerging markets, especially China, would have a higher weighting if measured using full market-cap weights and if restrictions and quotas for global investors were ignored (see DMS 2014).

Panel A of Figure 1.1 shows the national breakdown at the start of the DMS database. The UK stock market was the largest in the world, accounting for a quarter of world capitalization and dominating the United States, Germany, and France, each of which represented some 12%–15% of global equities. The next two markets, each accounting for 5%–6%, are those of Russia and Austria. They are followed by two Benelux countries (Belgium and the Netherlands) and two then-British colonies (Australia and South Africa), which are in turn trailed by 12 smaller markets. In total, the DMS database covers 98.3% of global equity market capitalization at the start of 1900.

Early in the 20th century, the United States overtook the United Kingdom to become the world's dominant stock market (although from the start of 1988 until the start of 1990, Japan was briefly the largest, with a weighting of almost 45% of the World Index at the start of 1989 compared with 29% for the United States). The changing fortunes of individual countries, which we evaluate in detail in DMS (2013), raise two important issues. The first is survivorship bias. While investors in some countries were lucky, others suffered financial disaster. Incorporating China and Russia into our database—the two best-known cases of markets that failed to survive—addresses this issue. China was a small market in 1900 and in subsequent decades, but Russia accounted for some 6% of world market capitalization in 1900. Similarly, Austria–Hungary had a 5% weighting in the 1900 World Index, and although it was not a total catastrophe, it was the worst-performing equity market and the second-worst bond market among the 21 countries with continuous investment histories. Incorporating Austria, China, and Russia drastically reduces the potential for bias in world market returns from ignoring non-surviving and deeply unsuccessful markets.

Panel B of Figure 1.1 shows that today the US market dominates its closest rivals, accounting for more than half of global stock market value. Japan and the United Kingdom are next, each representing 7%–9% of global equities. Switzerland, France, and Germany each represent about 3% of the global market, and Canada, Australia, and China now represent around 2% each. These markets are followed by 14 smaller markets. The areas in the pie charts

Figure 1.1. Relative Sizes of World Stock Markets, 1 January 1900 versus 1 January 2016



Sources: DMS (2002, 2016b); FTSE Russell (2015).

labelled "omitted" represent countries that are excluded because the available data do not extend all the way forward from 1900 to 2016 or all the way backward from 2016 to 1900. The former are small markets that failed to prosper ("submerging markets"); the latter are mostly markets that came into existence after 1900 ("emerging markets").

An issue more serious than survivorship bias is success bias. The United States is the world's best-documented capital market, and prior to assembly of the DMS database, the evidence cited on long-run asset returns was predominantly US-based, mostly from Ibbotson Associates (see, for example, Ibbotson Associates 1999). Extrapolating from an unusually successful market—ignoring the fact that the economic and financial performance of that nation was exceptional—introduces success bias. That is mitigated by making inferences from the experience of a broad sample of countries.

The Great Transformation[1]

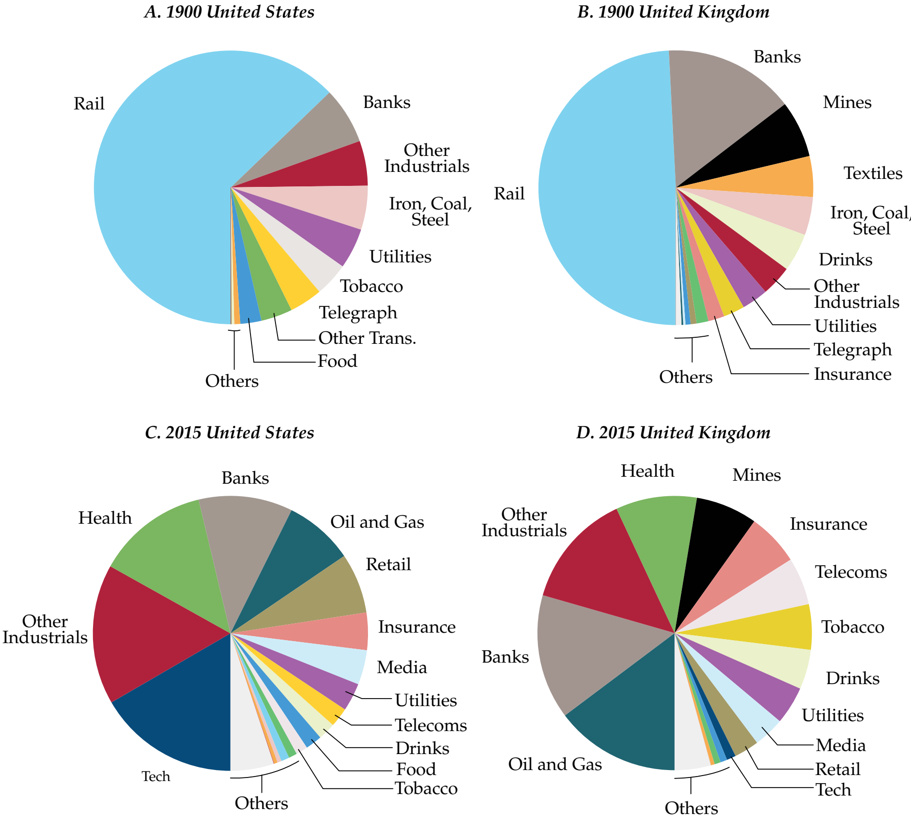
At the beginning of 1900—the start date of our global returns database—virtually no one had driven a car, made a phone call, used an electric light, heard recorded music, or seen a movie; no one had flown in an aircraft, listened to the radio, watched TV, used a computer, sent an e-mail, or used a smartphone. There were no x-rays, body scans, DNA tests, or transplants, and no one had taken an antibiotic; as a result, many would die young.

Mankind has enjoyed a wave of transformative innovation dating from the Industrial Revolution, continuing through the Golden Age of Invention in the late 19th century, and extending into today's information revolution. These transformations have given rise to entire new industries: electricity and power generation, automobiles, aerospace, airlines, telecommunications, oil and gas, pharmaceuticals and biotechnology, computers, information technology, and media and entertainment. Meanwhile, makers of horse-drawn carriages and wagons, canal boats, steam locomotives, candles, and matches have seen their industries decline. There have been profound changes in what is produced, how it is made, and the way in which people live and work.

These changes can be seen in the shifting composition of the firms listed on world stock markets. **Figure 1.2** shows the industrial composition of listed companies in the United States and the United Kingdom. The upper two pie charts show the position at the beginning of 1900, while the lower two show the beginning of 2015. Markets at the start of the 20th century were dominated by railroads, which accounted for 63% of US stock market value and almost 50% in the United Kingdom. More than a century later, railroads

[1]Material in this section from Dimson, Marsh, and Staunton (2015).

Figure 1.2. Industry Weightings in the USA and UK, 1900 Compared with 2015



Note: For 1900, UK data are based on the top 100 companies and US data on the total market.
Sources: DMS (2002, 2015); FTSE Russell 2015.

declined almost to the point of stock market extinction, representing less than 1% of the US market and close to zero in the UK market.

Of the US firms listed in 1900, more than 80% of their value was in industries that are today small or extinct; the UK figure is 65%. Besides railroads, other industries that have declined precipitously are textiles, iron, coal, and steel. These industries still exist but have moved to lower-cost locations in the emerging world. Yet, similarities between 1900 and today are also apparent. The banking and insurance industries continue to be important. Similarly, such industries as food, beverages (including alcohol), tobacco, and utilities were present in 1900 just as they are today. And, in the United

Kingdom, quoted mining companies were important in 1900 just as they are in London today.

But even industries that initially seem similar have often altered radically. For example, compare telegraphy in 1900 with smartphones today. Both were high-tech at the time. Or contrast other transport in 1900—shipping lines, trams, and docks—with their modern counterparts, airlines, buses, and trucking. Similarly, within manufacturing and industrials, the 1900 list of companies includes the world's then-largest candle maker and the world's largest manufacturer of matches.

Another statistic that stands out from Figure 1.2 is the high proportion of today's companies whose business is in industries that were small or non-existent in 1900, 62% by value for the United States and 47% for the United Kingdom. The largest industries today are technology (notably in the United States), oil and gas, banking, healthcare, the catch-all group of other industrials, mining (for the United Kingdom), telecommunications, insurance, and retail. Of these, oil and gas, technology, and health care (including pharmaceuticals and biotechnology) were almost totally absent in 1900. Telecoms and media, at least as we know them now, are also new industries.

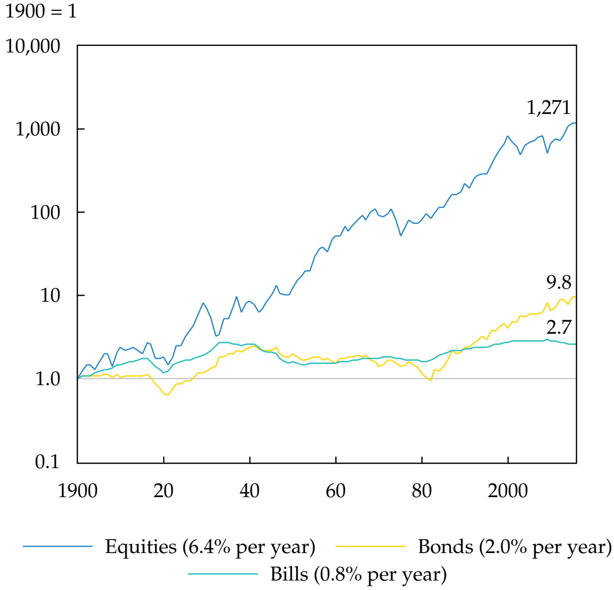
Our analysis relates only to exchange-listed businesses. Some industries existed throughout the period but were not always listed. For example, there were many retailers in 1900, but apart from the major department stores, these were often small, local outlets rather than national and global retail chains like Walmart or Tesco. Similarly, in 1900 a higher proportion of manufacturing firms were family owned and unlisted. In the United Kingdom and other countries, nationalization has also caused entire industries—railroads, utilities, telecoms, steel, airlines, airports—to be delisted, often to be re-privatized at a later date. We included listed railroads, for example, while omitting highways that remain largely state-owned. The evolving composition of the corporate sector highlights the importance of avoiding survivorship bias within a stock market index, as well as across indices (see DMS 2002).

Long-Run Asset Returns

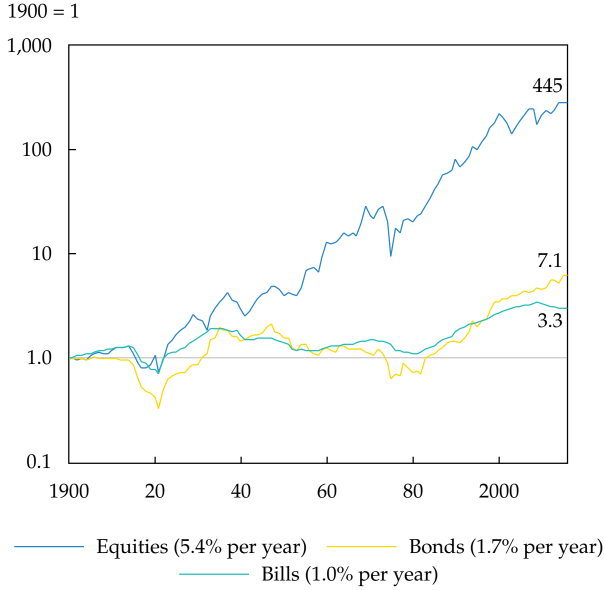
Figure 1.3 shows the cumulative real total return for the main asset categories in the United States and the United Kingdom. Returns include reinvested income, are measured in local currency, and are adjusted for inflation. In each country, equities performed best, long-term government bonds less well, and Treasury bills the worst. In the United States, an initial investment of $1 grew in real value to $1,271 if invested in equities, $10 in bonds, and $2.7 in bills. In the United Kingdom, an initial investment of £1 grew in real value to £445 if invested in equities, £7 in bonds, and £3.3 in bills.

Figure 1.3. Cumulative Returns on US and UK Asset Classes in Real Terms, 1900–2015

A. United States



B. United Kingdom



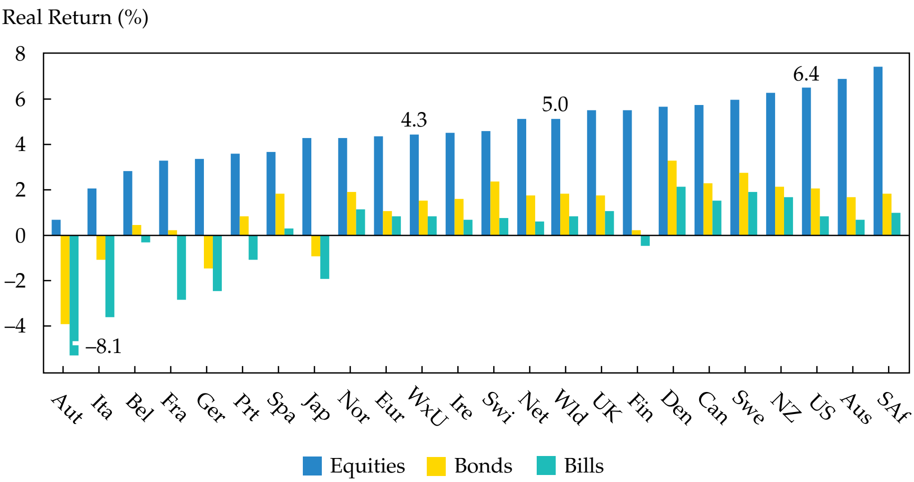
Sources: DMS (2016b, 2016c).

We previously noted the need for caution when generalizing from the United States, which, with hindsight, emerged as the world's premier economic power. We have already shown the acceptable, but lower, long-term performance of the United Kingdom. For a more complete view, we examine investment returns in other countries. **Figure 1.4** shows annualized real equity, bond, and bill returns over the period 1900–2015 for the 21 countries with continuous index histories, plus the World Index (Wld), the World ex-USA (WxU), and Europe (Eur). The abbreviations for each market are listed in Appendix 1.1. Markets are ranked in ascending order of real (inflation-adjusted) equity market returns, which were positive in every location, typically at a level of 3% to 6% per year. Equities were the best-performing asset class everywhere. Bonds beat bills in every country.

In most countries, bonds gave a positive real return over the 116 years, with just four exceptions: Austria, Italy, Germany, and Japan. These countries also delivered poor equity performance, the origins of which date from the first half of the 20th century. These were the countries that suffered most from the ravages of war and from ensuing periods of high or hyperinflation.

Figure 1.4 shows that the United States performed well, ranking third for equity performance (6.4% per year) and sixth for bonds (2.0% per year). This confirms the conjecture that US returns would be above average. However, the differences in annualized performance are moderate. Although its stock

Figure 1.4. Real Annualized Returns (%) on Equities versus Bonds and Bills Internationally, 1900–2015



Sources: Appendices 1.2, 1.4, and 1.5 in this chapter.

market performance was good, the United States was not the top performer and its return was not especially high relative to the world averages. The real return on US equities of 6.4% contrasts with the real US dollar return of 4.3% on the World ex-USA Index. A common factor among the best-performing equity markets over the last 116 years is that they tended to be resource-rich and/or New World countries.

Although risky equities, viewed as an asset class, performed better than less-volatile bonds or bills, investors did not benefit from investing in more-volatile stock markets as compared to more-stable markets. US equities had a standard deviation of returns of 20.1%, placing the United States among the lower-risk markets ranking sixth after Canada (17.0%), Australia (17.7%), New Zealand (19.4%), Switzerland (19.5%), and the United Kingdom (19.7%). The World Index, with a standard deviation of just 17.5%, shows the risk reduction obtained from international diversification. The most volatile markets were Portugal (34.4%), Germany (31.7%), Austria (30.0%), Finland (30.0%), Japan (29.6%), and Italy (28.5%), which were the countries most seriously affected by the depredations of war, civil strife, and inflation, and (in Finland's case) also reflecting the risk of a concentrated market in more-recent periods. Further details on the risk and return from equity investing are presented in Appendix 1.2.

Inflation, Bills, and Bonds

Inflation was a major force in the 20th century. In the United States, annualized inflation was 2.9% per year, versus 3.7% in the United Kingdom. This apparently small difference means that, since 1900, US consumer prices rose by a factor of 27 and UK prices rose 69-fold. Prices did not rise steadily over the 116 years, and all the DMS countries experienced deflation at some stage in the 1920s and early 1930s. In the United States, consumer prices fell by almost a third in the years after 1920 and did not regain their 1920 level until 1947. In three-quarters of the years since the mid-1990s, one or more of our 21 countries experienced (generally mild) deflation. Over the last 116 years, there were seven high inflation countries: Germany, Austria, Portugal, Finland, France, Japan, and Spain. There were two runners-up, Belgium and South Africa, and one low-inflation country, Switzerland. Further details on historical inflation rates are provided in Appendix 1.3. Note that the true 116-year mean and standard deviation for Germany are far higher than Appendix 1.3 shows because the hyperinflationary years of 1922–23 are omitted from the table.

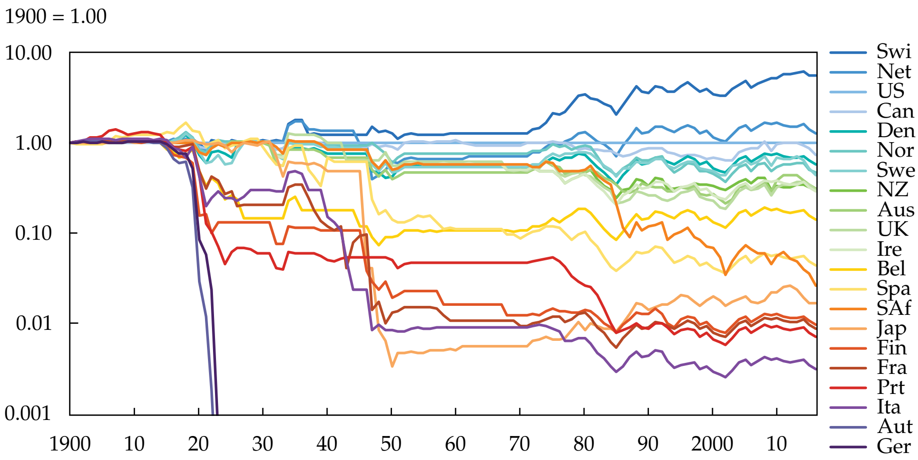
Treasury bills provide a benchmark for the risk-free rate of interest. Since 1900, US and UK investors earned annualized real (inflation-adjusted) returns of 0.8% and 1.0%, respectively. Over the period, there were negative real returns on bills in eight countries: Austria, Belgium, Finland, France, Germany, Italy, Japan, and Portugal. If we include the hyperinflation of 1922–23, German bill (and bond) investors lost virtually everything in real terms. Further details on real interest rates over the long term are in Appendix 1.4.

Government bonds were on average disappointing for investors over the 116 years from 1900 to 2015. Across the 21 countries, the average annualized real return was 1.0% (1.2% excluding Austria's very low figure). Although this exceeds the return on cash by 1.3%, bonds had much higher risk. As already noted, real bond returns were negative in four countries, with German bonds doing worst once the 1922–23 hyperinflation is incorporated. In the United Kingdom, the annualized real bond return was 1.7%, while US bondholders did better with a real return of 2.0% per year. Over the full period, Denmark, Sweden, Switzerland, Canada, and New Zealand did better than the USA, with real bond returns of 3.2%, 2.7%, 2.4%, 2.3%, and 2.1%, respectively. Note that Danish bond returns were estimated from mortgage bonds over part of their history (see DMS 2016b) and were thus exposed to some credit risk. The best-performing country in terms of pure government bonds was therefore Sweden, with an annualized real return of 2.7%. Since 1900, the average standard deviation of real bond returns was 13.1%, versus 23.6% for equities and 7.7% for bills (these averages exclude Austria). US real bond returns had a standard deviation of 10.4%, versus 20.1% for equities and 4.6% for bills. Further details on real bond returns are in Appendix 1.5.

Exchange Rates

For decades, investors have been exhorted to diversify internationally so they can benefit from the "free lunch" of risk reduction through diversification. It is an old idea: More than a century ago when capital flowed freely, London, New York, Amsterdam, and Paris facilitated the development of transport systems, utilities, and natural resources around the world. In those days, many currencies were linked to the price of gold and foreign exchange risk seemed unimportant. However, that was to change as the 20th century unfolded. **Figure 1.5** compares our 21 countries' exchange rates against the US dollar. On the left of the graph, we show the dollar value of 5.38 Swiss francs, 0.21 British pounds, and the sums in other currencies that equated to one dollar at the beginning of 1900. That is, we re-based the exchange rates at the start of 1900 to a value of 1.0. The vertical axis displays the number of dollars required to purchase one local currency unit (after re-basing). A depreciating currency trends downward, while an appreciating currency trends upward.

Figure 1.5. Nominal Exchange Rates, 1900–2015, in US Dollars per Unit of Local Currency (rebased to 1900=1)



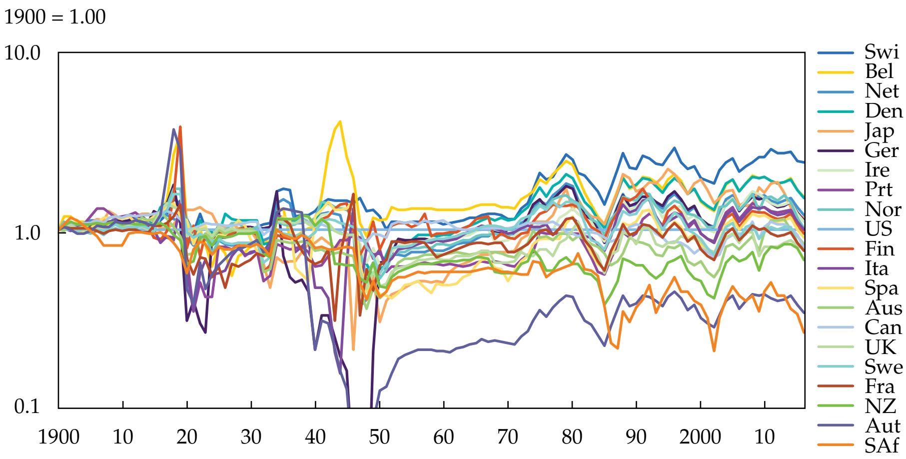
Sources: DMS (2002, 2016b, 2016c).

Because of Austria's ultrahigh inflation that peaked in 1922 and Germany's hyperinflation that peaked in 1923, the currencies of these two countries were debased to a negligible value. Other currencies took longer to move less. By the beginning of 2016, the currencies in the diagram had depreciated to the point where the number of Italian currency units (lira, followed by euros) that could be bought for one dollar was 314 times as large as in 1900; the number of yen was 59 times larger; and the number of British pounds was 3.3 times larger. The strongest currency was the Swiss franc, which had appreciated until, by today, one dollar could buy only 18 rappen (Swiss centimes)—that is, 0.18 Swiss francs, one-sixth of the number of francs that the dollar could have bought in 1900.

At the start of 1900, the exchange rate between US dollars and British pounds was \$1 = £0.208, almost five dollars to the pound. By the end of 2015, the pound had weakened to \$1 = £0.67—only 1.48 dollars for each pound, a fall of 1% per year. But the strengthening of the dollar against the pound was accompanied by lower inflation in the United States than in the United Kingdom. So, to determine the "real" movement in the exchange rate, we must adjust the exchange rate for inflation in the United States relative to the United Kingdom. The inflation-adjusted, or real, exchange rate is defined as the nominal exchange rate multiplied by the ratio of the two countries' inflation indices. Over the long run, the real dollar/pound exchange rate moved by much less than the nominal exchange rate, increasing by 0.22% per year.

Figure 1.6 presents the real exchange rates for the 21 countries with a complete history over the period from 1900 onward. Note that the vertical scale is quite different from the previous chart of nominal exchange rates. As with the real dollar/pound rate discussed above, these inflation-adjusted currency values have been comparatively stable over this long interval, albeit with large spikes for countries that emerged from wartime defeat. Consistent with the findings in Taylor (2002), real exchange rates do not appear to exhibit a long-term upward or downward trend but are clearly volatile. Over the long term, it is remarkable that no country had a currency that in real terms appreciated against the US dollar by as much as 1% per year (the strongest, the Swiss franc, appreciated by 0.76% per year). Only one country had a currency that depreciated by as much as 1% per year (the weakest, the South African rand, depreciated by –1.15% per year). Detailed real exchange rate statistics for 1900–2015 are provided in Appendix 1.7.

Figure 1.6. Real Exchange Rates, 1900–2015, in US Dollars per Unit of Local Currency (rebased to 1900=1)



Sources: DMS (2002, 2016b, 2016c).

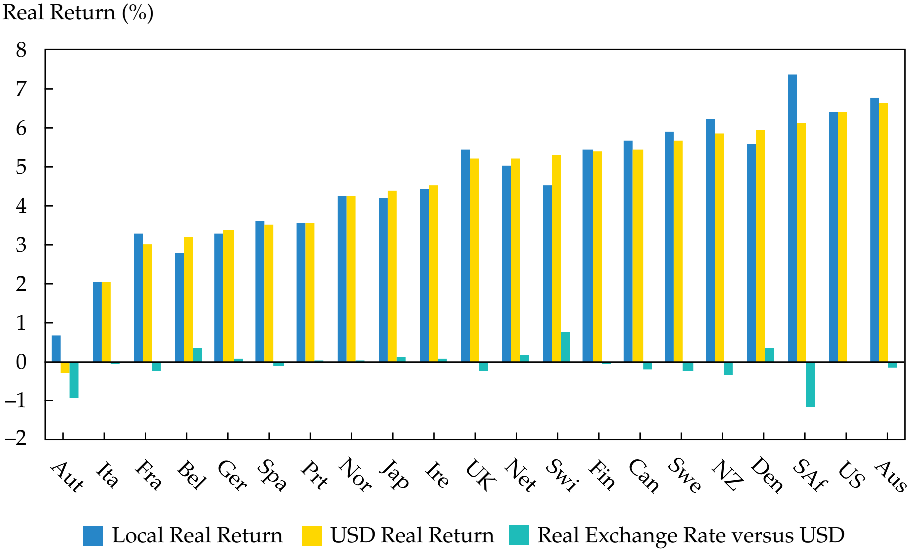
Common-Currency Returns

We have displayed the real returns to a domestic equity investor based on local purchasing power in that investor's home country (see Figure 1.4 and Appendix 1.2). For example, over the period 1900–2015, the annualized real return to an American buying US equities was 6.4%, and for a Swiss investor buying Swiss equities it was 4.5%. However, when considering cross-border investment, we also need to account for exchange rate movements. To illustrate, consider an American buying Swiss equities and a Swiss investor buying US equities. Each investor now has two exposures, one to foreign equities and the other to foreign currency. We thus convert each investor's return into his or her reference currency.

To convert nominal returns, we use changes in the nominal exchange rate. By analogy, to convert real returns in one currency into real returns in another, we simply adjust by the change in the real exchange rate. Over the period 1900–2015, Appendix 1.7 shows that the real (inflation-adjusted) Swiss franc was stronger than the US dollar by 0.76% per year. Thus, the American who invested in Switzerland had a real return of 4.48% (from Swiss equities) plus 0.76% (from the Swiss franc), giving an overall return of (1+4.48%) × (1+0.76%) – 1 = 5.28% (all numbers rounded). In contrast, the Swiss investor who invested in America had a real return of 6.36% (from US equities) minus 0.76% (from the US dollar), namely (1+6.36%) × (1–0.76%) – 1 = 5.55% (again, rounded).

To provide a common-currency view of stock market investing, **Figure 1.7** therefore converts local-currency real returns into US dollar-denominated real returns. It simply involves adding each country's real exchange rate movement to the local real returns we presented in Figure 1.4. In the case of Switzerland, for example, the domestic real return is 4.5% and the real exchange rate movement is +0.76%. Adding these (geometrically) gives the real dollar return of 5.3% that we just discussed. It is clear that, over the long haul, the cross section of stock market returns reflects differing real equity performances far more than differing real exchange rates.

Figure 1.7. Real Annualized Equity Returns (%) in Local Currency and US Dollars, 1900–2015



Sources: DMS (2002, 2016b, 2016c).

Conclusion

Since 1900, there have been transformational changes in the relative sizes of stock markets around the world. Coinciding with these developments, there has been a fundamental change in the industries represented on major stock exchanges. Although there have been setbacks, over the 116 years, equities beat bonds and bills in all 21 countries for which we have a continuous stock market history. For the world as a whole, equities outperformed bills by 4.2% per year and bonds by 3.2% per year. Over the long run, there was a reward for the higher risk of investing in stocks.

Currencies fluctuated considerably between 1900 and 2015. Over this long interval, most currencies weakened against the US dollar and only a few, led by the Swiss franc, strengthened. Yet during this 116-year period, foreign exchange fluctuations were largely a response to relative inflation. Over more than a century, real exchange rates against the US dollar changed by an annualized amount that was, in almost every case, below 1% per year. Common-currency returns have thus been quite close to, and have a very similar ranking to, real returns expressed in local currency terms.

We have provided an update on long-run rates of return on stocks, bonds, bills, currencies, and inflation in the 21 countries with continuous histories since 1900. We have updated and commented on the key statistics, charts, and findings from *Triumph of the Optimists* (DMS 2002). Interested readers also are referred to the *Global Investment Returns Sourcebook* (DMS 2016b) for additional analysis.

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Appendices

The appendices below provide summary statistics on the return series for 21 countries and three regions with a continuous history. The markets are identified by the abbreviated names listed in **Appendix 1.1**. **Appendix 1.2** summarizes global equity returns; **Appendix 1.3** reports inflation rates; **Appendices 1.4** and **1.5** present real interest rates and real bond returns; and **Appendices 1.6** and **1.7** present nominal and real exchange rate changes. The data sources are the DMS dataset distributed by Morningstar (DMS 2016c) and the *Global Investment Returns Sourcebook* (DMS 2016b), which updates and extends the statistics presented in *Triumph of the Optimists* (DMS 2002).

The structure of Appendices 1.2–1.7 is as follows. The geometric means in the second column show the 116-year annualized returns achieved by investors; these are the figures that are plotted for selected asset-class returns in Figure 1.4. The arithmetic means in the third column show the average of the 116 annual returns for each market. The arithmetic mean of a sequence of different returns is always larger than the geometric mean, and the more volatile the sequence of returns, the greater the amount by which the arithmetic mean exceeds the geometric mean. This is verified by the fifth column, which shows the standard deviation of each market's returns. The fourth column presents the standard error of the arithmetic mean return (the lower the standard error, the more precise the estimate of the mean return). The sixth and eighth columns present the lowest and highest annual return for each market, respectively, and those returns are accompanied in the seventh and ninth columns by the years in which these extreme events occurred.

Note that Appendices 1.6 and 1.7 report each country's annualized rate of currency appreciation or depreciation in terms of the dollar value of local currency units. A strong currency (e.g., the Swiss franc) is shown by a positive rate of change in column two: More dollars are needed to buy one franc. A weak currency has a negative rate of change: Fewer dollars are needed to buy a unit of the currency.

Appendix 1.1. Markets Presented in This Study and Their Abbreviations

Country	Abbreviation	Country	Abbreviation	Country/ Region	Abbreviation
Australia	Aus	Ireland	Ire	Spain	Spa
Austria	Aut	Italy	Ita	Sweden	Swe
Belgium	Bel	Japan	Jap	Switzerland	Swi
Canada	Can	The Netherlands	Net	United Kingdom	UK
Denmark	Den	New Zealand	NZ	United States	US
Finland	Fin	Norway	Nor	Europe	Eur
France	Fra	Portugal	Prt	World ex-USA	WxU
Germany	Ger	South Africa	SAf	World	Wld

Appendix 1.2. Real (Inflation-Adjusted) Equity Returns around the World, 1900–2015

Country	Geometric mean%	Arithmetic mean%	Standard error%	Standard deviation%	Minimum return%	Minimum year	Maximum return%	Maximum year
Aus	6.7	8.3	1.6	17.7	–42.5	2008	51.5	1983
Aut	0.7	4.7	2.8	30.0	–60.1	2008	127.1	1985
Bel	2.8	5.4	2.2	23.7	–48.9	2008	105.1	1919
Can	5.6	7.0	1.6	17.0	–33.8	2008	55.2	1933
Den	5.5	7.4	1.9	20.9	–49.2	2008	107.8	1983
Fin	5.4	9.3	2.8	30.0	–60.8	1918	161.7	1999
Fra	3.2	5.8	2.1	23.1	–41.5	2008	66.1	1954
Ger	3.3	8.2	2.9	31.7	–90.8	1948	154.6	1949
Ire	4.4	7.0	2.1	23.0	–65.4	2008	68.4	1977
Ita	2.0	6.0	2.7	28.5	–72.9	1945	120.7	1946
Jap	4.2	8.8	2.7	29.6	–85.5	1946	121.1	1952
Net	5.0	7.1	2.0	21.4	–50.4	2008	101.6	1940
NZ	6.2	7.9	1.8	19.4	–54.7	1987	105.3	1983
Nor	4.2	7.1	2.5	26.9	–53.6	2008	166.9	1979
Prt	3.5	8.5	3.2	34.4	–76.6	1978	151.8	1986
SAf	7.3	9.4	2.1	22.1	–52.2	1920	102.9	1933
Spa	3.6	5.8	2.0	22.0	–43.3	1977	99.4	1986
Swe	5.9	8.0	2.0	21.2	–42.5	1918	67.5	1999
Swi	4.5	6.3	1.8	19.5	–37.8	1974	59.4	1922
UK	5.4	7.2	1.8	19.7	–57.1	1974	96.7	1975
US	6.4	8.3	1.9	20.1	–38.4	1931	56.2	1933
Eur	4.2	6.1	1.8	19.8	–47.5	2008	75.7	1933
WxU	4.3	6.0	1.8	19.0	–44.2	2008	80.0	1933
Wld	5.0	6.5	1.6	17.5	–41.4	2008	68.0	1933

Sources: DMS (2002, 2016b, 2016c).

Appendix 1.3. Inflation Rates around the World, 1900–2015

Country	Geometric mean%	Arithmetic mean%	Standard error%	Standard deviation%	Minimum return%	Minimum year	Maximum return%	Maximum year
Aus	3.8	3.9	0.5	5.1	–12.6	1921	19.3	1951
Aut	12.7	32.0	16.7	180.1	–5.0	1931	1748.1	1922
Bel	5.0	6.1	1.5	16.5	–37.9	1919	96.3	1917
Can	3.0	3.1	0.4	4.5	–15.8	1921	15.1	1917
Den	3.8	3.9	0.6	6.0	–15.1	1926	24.4	1940
Fin	7.1	8.8	2.4	26.2	–11.3	1919	241.4	1918
Fra	6.9	7.5	1.1	12.1	–18.4	1921	65.1	1946
Ger*	4.6	5.4	1.4	14.8	–9.5	1932	209 bn	1923
Ire	4.1	4.3	0.6	6.9	–26.0	1921	23.3	1981
Ita	8.1	10.4	3.2	34.3	–9.7	1931	344.4	1944
Jap	6.7	10.0	3.8	40.9	–18.7	1930	361.1	1946
Net	2.9	3.0	0.4	4.7	–13.4	1921	18.7	1918
NZ	3.6	3.7	0.4	4.6	–12.0	1932	14.7	1980
Nor	3.6	3.9	0.7	7.2	–19.5	1921	40.3	1918
Prt	7.4	8.2	1.4	14.7	–17.6	1948	80.9	1918
SAf	4.9	5.2	0.7	7.3	–17.2	1921	47.5	1920
Spa	5.6	5.8	0.6	6.8	–6.7	1928	36.5	1946
Swe	3.4	3.6	0.6	6.6	–25.2	1921	39.4	1918
Swi	2.2	2.3	0.5	5.2	–17.7	1922	25.7	1918
UK	3.7	3.9	0.6	6.5	–26.0	1921	24.9	1975
US	2.9	3.0	0.4	4.8	–10.7	1921	20.5	1918

*For Germany, the means, standard deviation, and standard error are based on 114 years, excluding 1922–23.
Sources: DMS (2002, 2016b, 2016c).

Appendix 1.4. Real Interest Rates around the World, 1900–2015

Country	Geometric mean%	Arithmetic mean%	Standard error%	Standard deviation%	Minimum return%	Minimum year	Maximum return%	Maximum year
Aus	0.7	0.8	0.5	5.3	–15.5	1951	18.5	1921
Aut	–8.0	–3.9	1.7	18.6	–94.2	1922	12.6	1931
Bel	–0.3	0.6	1.2	12.7	–46.6	1941	69.0	1919
Can	1.5	1.6	0.4	4.8	–12.5	1947	27.1	1921
Den	2.1	2.3	0.6	6.0	–15.8	1940	25.1	1921
Fin	–0.4	0.5	1.1	11.6	–69.2	1918	19.9	1919
Fra	–2.7	–2.2	0.9	9.4	–38.5	1946	29.7	1921
Ger*	–2.4	–0.4	1.2	13.0	–100.0	1923	38.8	1924
Ire	0.7	0.9	0.6	6.5	–15.5	1915	42.2	1921
Ita	–3.5	–2.5	1.0	11.3	–76.6	1944	14.2	1931
Jap	–1.9	–0.3	1.3	13.6	–77.5	1946	29.8	1930
Net	0.6	0.7	0.5	4.9	–12.7	1918	19.6	1921
NZ	1.7	1.8	0.4	4.6	–8.1	1951	21.1	1932
Nor	1.1	1.3	0.7	7.0	–25.4	1918	31.2	1921
Prt	–1.1	–0.5	0.9	9.7	–41.6	1918	23.8	1948
SAf	1.0	1.2	0.6	6.1	–27.8	1920	27.3	1921
Spa	0.3	0.5	0.5	5.7	–23.8	1946	12.6	1928
Swe	1.9	2.1	0.6	6.5	–23.2	1918	42.7	1921
Swi	0.8	0.9	0.5	4.9	–16.5	1918	25.8	1922
UK	1.0	1.2	0.6	6.3	–15.7	1915	43.0	1921
US	0.8	1.0	0.4	4.6	–15.1	1946	20.0	1921

*For Germany, the means, standard deviation, and standard error are based on 114 years, excluding 1922–23.
Sources: DMS (2002, 2016b, 2016c).

Appendix 1.5. Real Bond Returns around the World, 1900–2015

Country	Geometric mean%	Arithmetic mean%	Standard error%	Standard deviation%	Minimum return%	Minimum year	Maximum return%	Maximum year
Aus	1.7	2.5	1.2	13.2	–26.6	1951	62.2	1932
Aut	–3.8	4.8	4.8	51.2	–94.4	1945	441.6	1926
Bel	0.4	1.6	1.4	15.0	–45.6	1917	62.3	1919
Can	2.3	2.8	1.0	10.4	–25.9	1915	41.7	1921
Den	3.2	3.8	1.1	11.9	–18.2	1919	50.1	1983
Fin	0.2	1.4	1.3	13.7	–69.5	1918	30.2	1921
Fra	0.2	1.1	1.2	13.0	–43.5	1947	35.9	1927
Ger*	–1.4	1.3	1.5	15.8	–100.0	1923	62.5	1932
Ire	1.5	2.6	1.4	15.1	–34.1	1915	61.2	1921
Ita	–1.1	0.3	1.4	14.8	–64.3	1944	35.5	1993
Jap	–0.9	1.7	1.8	19.7	–77.5	1946	69.8	1954
Net	1.7	2.1	0.9	9.8	–18.1	1915	32.8	1932
NZ	2.1	2.5	0.8	9.0	–23.7	1984	34.1	1991
Nor	1.9	2.6	1.1	12.0	–48.0	1918	62.1	1921
Prt	0.8	2.6	1.7	18.7	–49.7	1994	82.4	1922
SAf	1.8	2.3	1.0	10.5	–32.6	1920	37.1	1921
Spa	1.8	2.5	1.2	12.6	–30.2	1920	53.2	1942
Swe	2.7	3.4	1.2	12.7	–37.0	1939	68.2	1921
Swi	2.4	2.7	0.9	9.4	–21.4	1918	56.1	1922
UK	1.7	2.6	1.3	13.7	–30.7	1974	59.4	1921
US	2.0	2.5	1.0	10.4	–18.4	1917	35.1	1982
Eur	1.1	2.4	1.5	16.2	–52.4	1919	72.8	1933
WxU	1.5	2.5	1.4	14.7	–45.5	1919	76.1	1933
Wld	1.8	2.4	1.0	11.3	–32.0	1919	46.7	1933

*For Germany, the means, standard deviation, and standard error are based on 114 years, excluding 1922–23.
Sources: DMS (2002, 2016b, 2016c).

Appendix 1.6. Nominal Exchange Rate Changes against the US Dollar, 1900–2015

Country	Geometric mean%	Arithmetic mean%	Standard error%	Standard devia-tion%	Minimum change%	Minimum year	Maximum change%	Maximum year
Aus	–1.0	–0.4	1.0	11.1	–39.4	1931	53.4	1933
Aut	–9.6	–4.0	2.1	22.1	–96.2	1922	53.0	1940
Bel	–1.7	–0.7	1.2	13.3	–41.9	1919	55.8	1933
Can	–0.3	–0.1	0.5	5.8	–20.0	2008	22.3	2003
Den	–0.5	0.2	1.1	11.4	–37.6	1946	40.2	1925
Fin	–3.9	–2.4	1.4	15.1	–73.3	1919	54.4	1933
Fra	–4.0	–1.5	1.8	19.4	–85.3	1946	91.3	1943
Ger*	–2.5	8.6	9.6	102.5	–100.0	1923	1046.3	1948
Ire	–1.1	–0.5	1.0	10.7	–30.2	1931	53.4	1933
Ita	–4.8	–3.0	1.5	16.7	–64.8	1946	59.1	1933
Jap	–3.5	–0.7	1.6	16.9	–91.7	1945	47.8	1933
Net	0.2	1.0	1.1	11.9	–59.1	1946	55.1	1933
NZ	–1.0	–0.3	1.2	12.5	–36.0	1942	74.2	1933
Nor	–0.7	0.0	1.1	12.0	–30.5	1931	49.5	1933
Prt	–4.2	–2.9	1.3	14.3	–70.5	1920	52.5	1933
SAf	–3.1	–2.0	1.3	14.1	–46.0	1985	46.1	1987
Spa	–2.7	–1.2	1.6	16.9	–62.2	1946	99.2	1939
Swe	–0.7	–0.1	1.0	10.5	–29.2	1931	44.7	1933
Swi	1.5	2.0	1.0	11.1	–29.4	1936	56.0	1933
UK	–1.0	–0.4	1.0	10.8	–30.2	1931	53.4	1933
US	0.0	0.0	0.0	0.0	0.0		0.0	

*For Germany, the means, standard deviation, and standard error are based on 114 years, excluding 1922–23.

Sources: DMS (2002, 2016b, 2016c).

Appendix 1.7. Real Exchange Rate Changes against the US Dollar, 1900–2015

Country	Geometric mean%	Arithmetic mean%	Standard error%	Standard devia-tion%	Minimum change%	Minimum year	Maximum change%	Maximum year
Aus	–0.16	0.52	1.1	11.7	–39.9	1931	46.4	1933
Aut	–0.93	2.06	2.0	21.9	–83.2	1919	74.7	1917
Bel	0.37	2.23	1.8	19.1	–68.6	1919	77.8	1917
Can	–0.21	–0.03	0.6	6.1	–19.2	2008	22.5	2003
Den	0.35	1.07	1.1	11.8	–47.6	1946	35.0	1933
Fin	–0.04	2.10	1.9	21.0	–79.4	1919	146.8	1918
Fra	–0.24	2.34	2.1	22.6	–79.4	1946	135.9	1943
Ger	0.10	13.45	11.7	125.8	–75.0	1945	1302.0	1948
Ire	0.09	0.70	1.0	11.1	–38.1	1946	53.6	1933
Ita	0.00	3.73	3.4	37.0	–64.9	1946	335.2	1944
Jap	0.14	2.98	2.9	30.7	–77.9	1945	290.2	1946
Ne	0.16	1.01	1.1	12.4	–61.6	1946	54.3	1933
NZ	–0.33	0.48	1.2	13.1	–39.7	1942	66.1	1933
Nor	0.01	0.75	1.1	12.1	–37.4	1946	46.4	1933
Prt	0.01	1.36	1.6	17.0	–52.1	1919	91.1	1924
SAf	–1.15	–0.01	1.4	15.4	–38.3	1985	60.5	1987
Spa	–0.09	1.33	1.7	18.0	–56.4	1946	128.7	1939
Swe	–0.21	0.40	1.0	11.0	–39.2	1919	41.0	1933
Swi	0.76	1.35	1.0	11.2	–29.1	1936	51.6	1933
UK	–0.22	0.43	1.1	11.4	–36.7	1946	52.6	1933
US	0.00	0.00	0.0	0.0	0.0		0.0	

Sources: DMS (2002, 2016b, 2016c).

Written Evidence of Dr. Cleary filed in the 2023 Alberta Generic Cost of Capital Proceedings

Exhibit AZ

McKinsey&Company

The Real Economy and Future Investment Returns

CalPERS

January 17, 2017

Summary

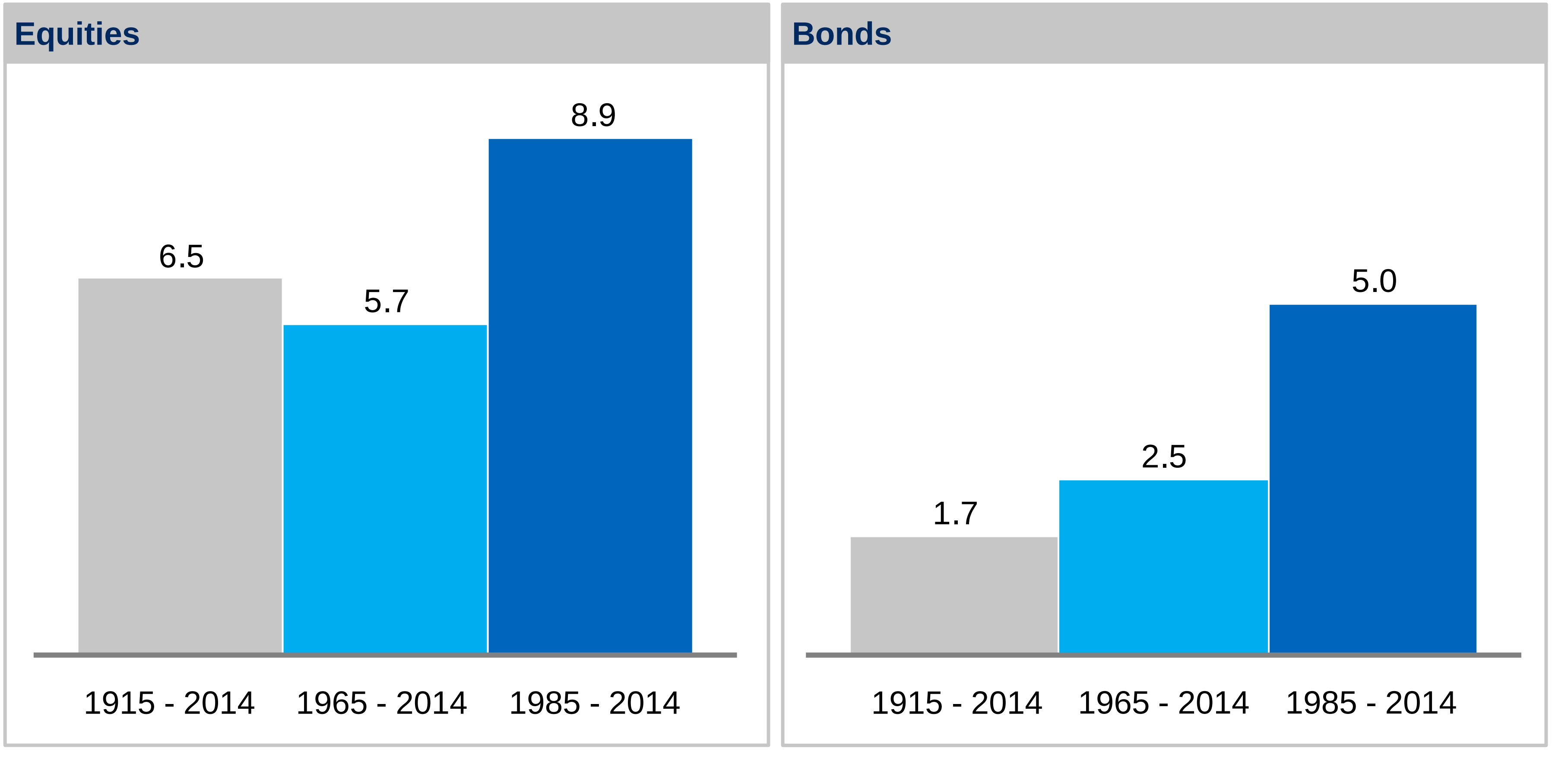
- Equity and bond returns driven by “real” economy
- Unique elements driving last 30 years returns are not repeatable (declining inflation/interest rates, increasing profit margins)
- Future long-term real returns could be 4.0 – 6.5% for equities and 0.0 – 2.0% for bonds
- Even under extreme scenarios, equities likely to outperform bonds under most time frames

SOURCE: Source

Returns on equities and bonds have been high over the past 30 years versus long-term average

Total real returns

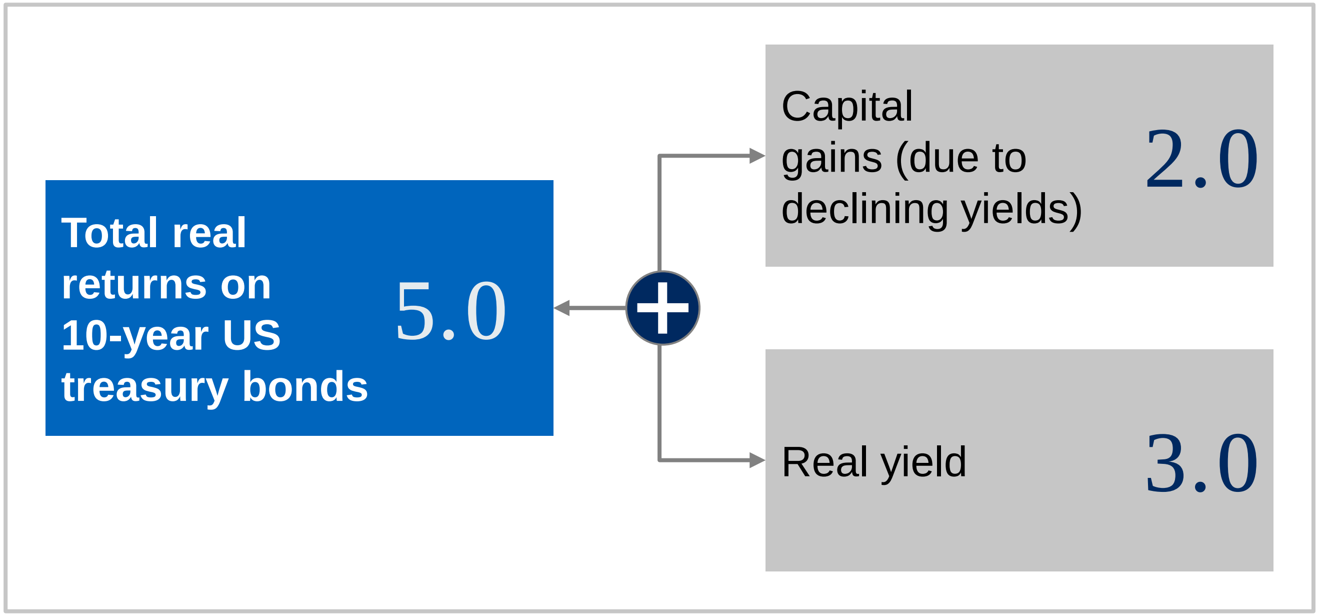
Annualized, based on 3-year average index at start and end years, %



SOURCE: Dimson-Marsh-Staunton Global Returns database; Damodaran database, Stern School of Business, New York University; Jutta Bolt and Jan Luiten van Zanden, The first update of the Maddison Project: Re-estimating growth before 1820, Maddison Project working paper number 4, University of Groningen, January 2013; Conference Board; McKinsey Global Institute analysis

During last 30 years, bond returns driven by capital gains

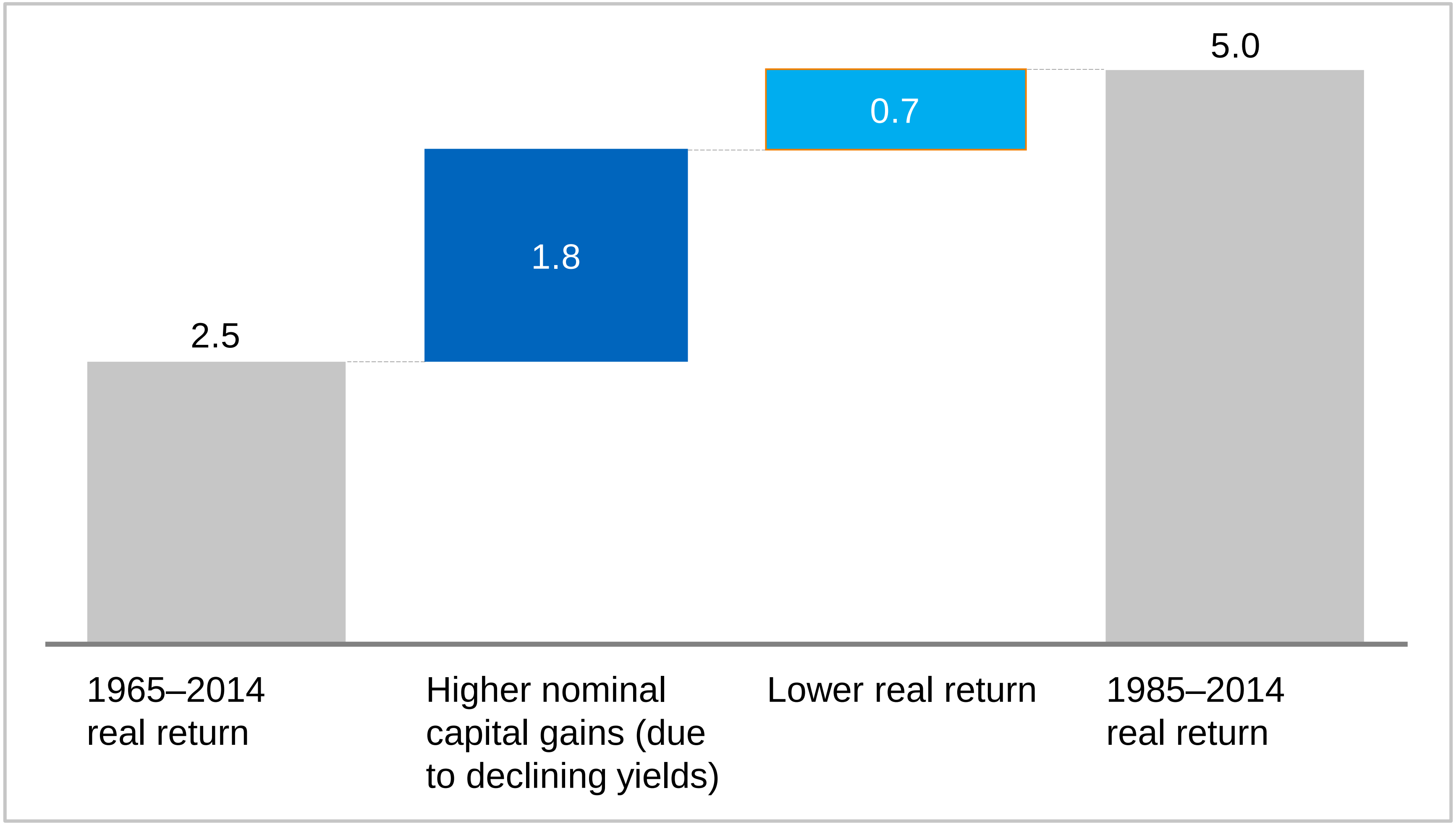
Percent, 1985 to 2014



Capital gains due to declining yields and inflation drove higher bond returns in the last 30 years

10-year US Treasury bond returns, annualized

Percent

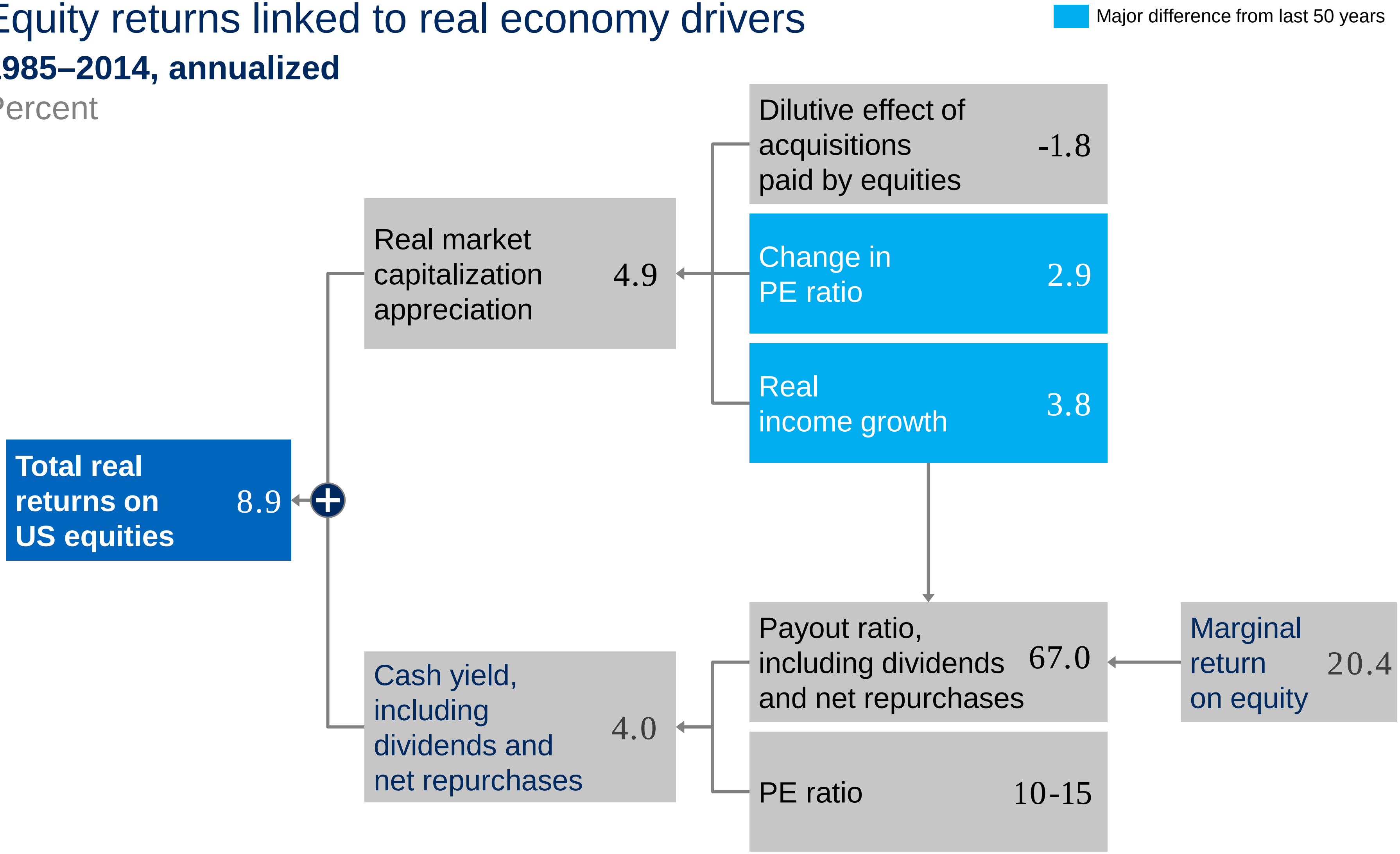


SOURCE: Dimson-Marsh-Staunton Global Returns database; Damodaran database, Stern School of Business, New York University; McKinsey Global Institute analysis

Equity returns linked to real economy drivers

1985–2014, annualized

Percent

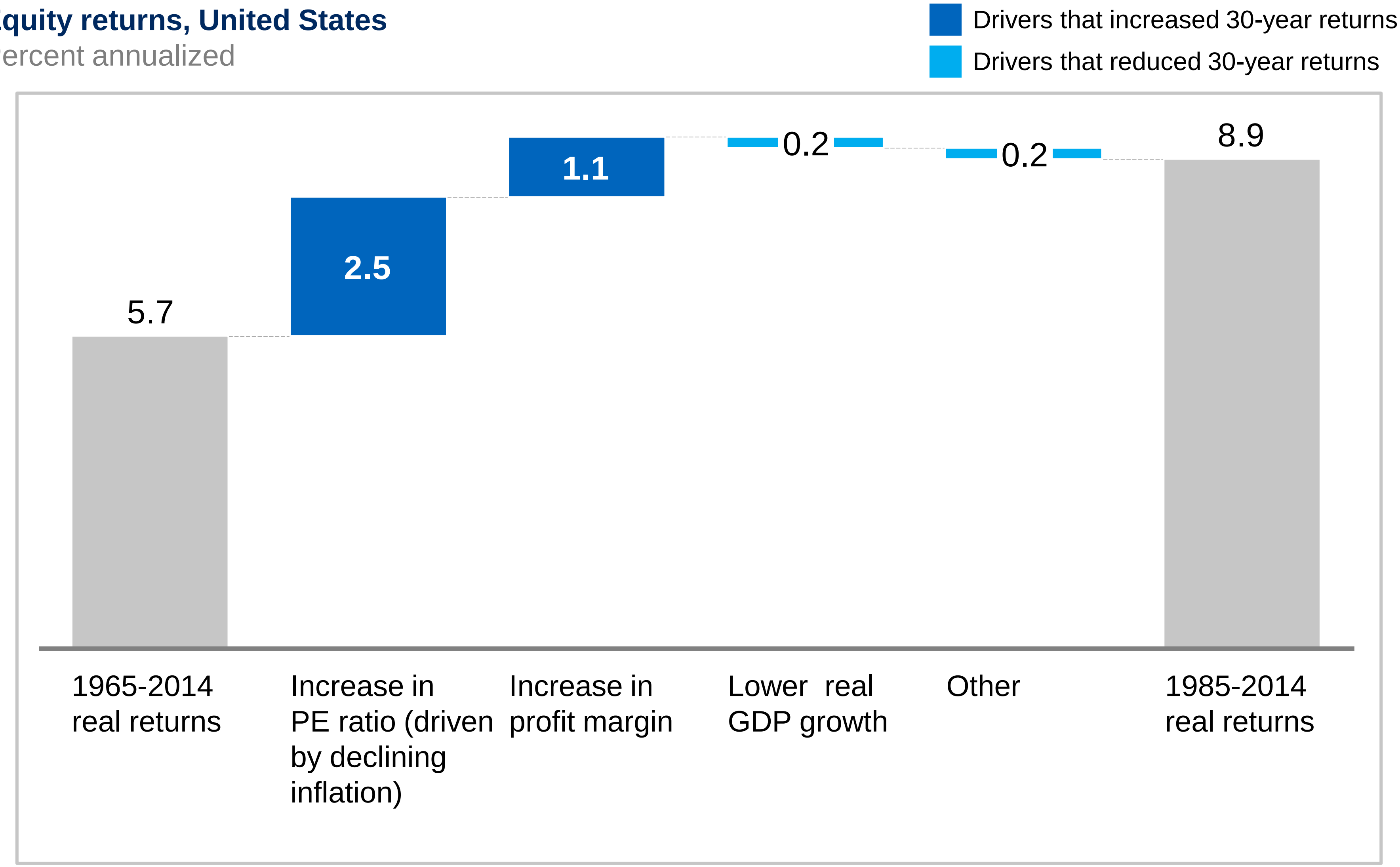


SOURCE: McKinsey Corporate Performance Analytics; McKinsey Global Institute analysis

Declining inflation, which increased PE ratios, and increasing margins drove higher equity returns in the United States in the last 30 years

Equity returns, United States

Percent annualized



1980s started with unusually high inflation and interest rates

10-year US Treasury yields and annual inflation

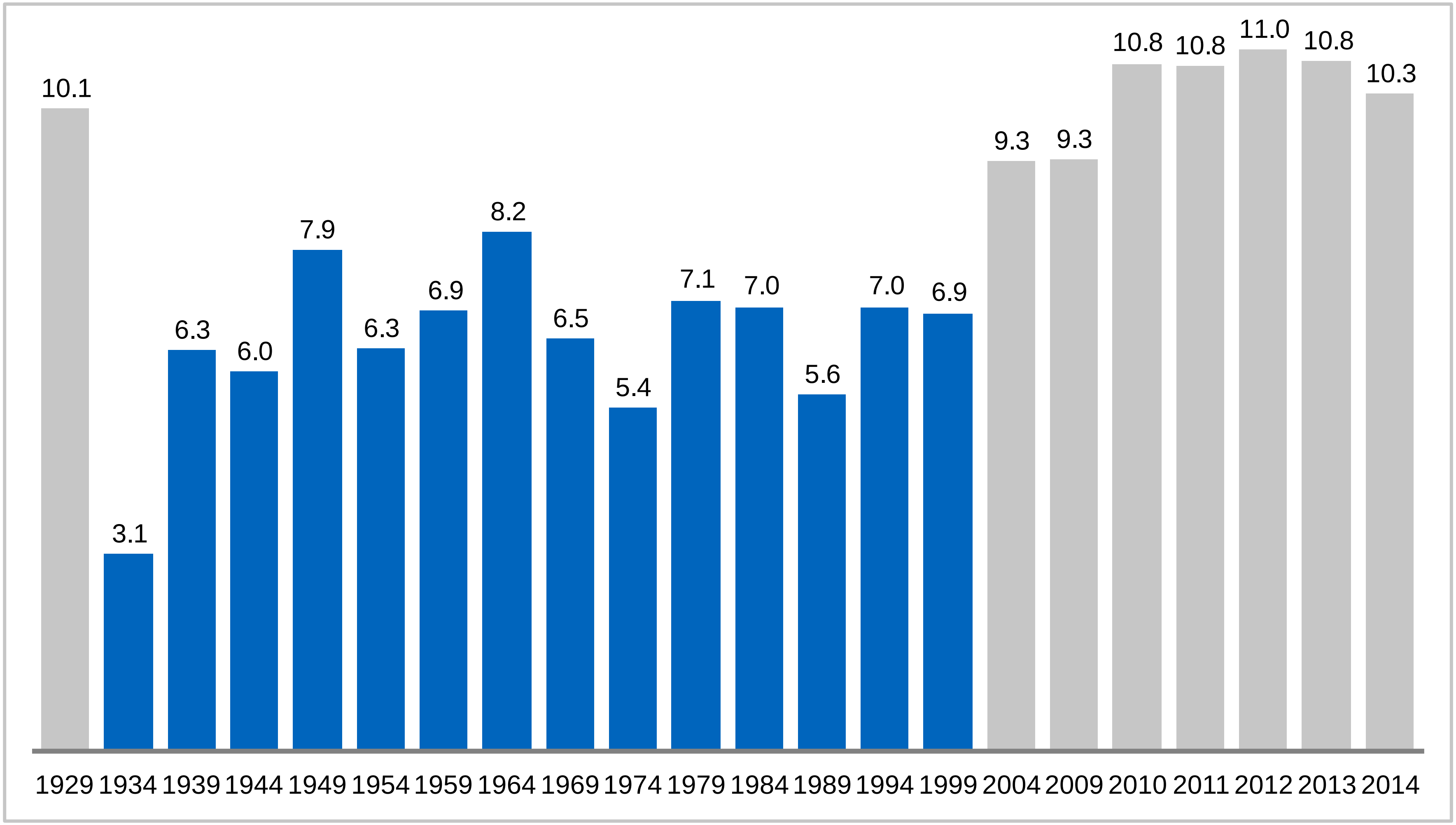
Percent

SOURCE: Source

US corporate profits are at their highest level vs. GDP since 1929

US after-tax corporate profits as share of US national income

Percent

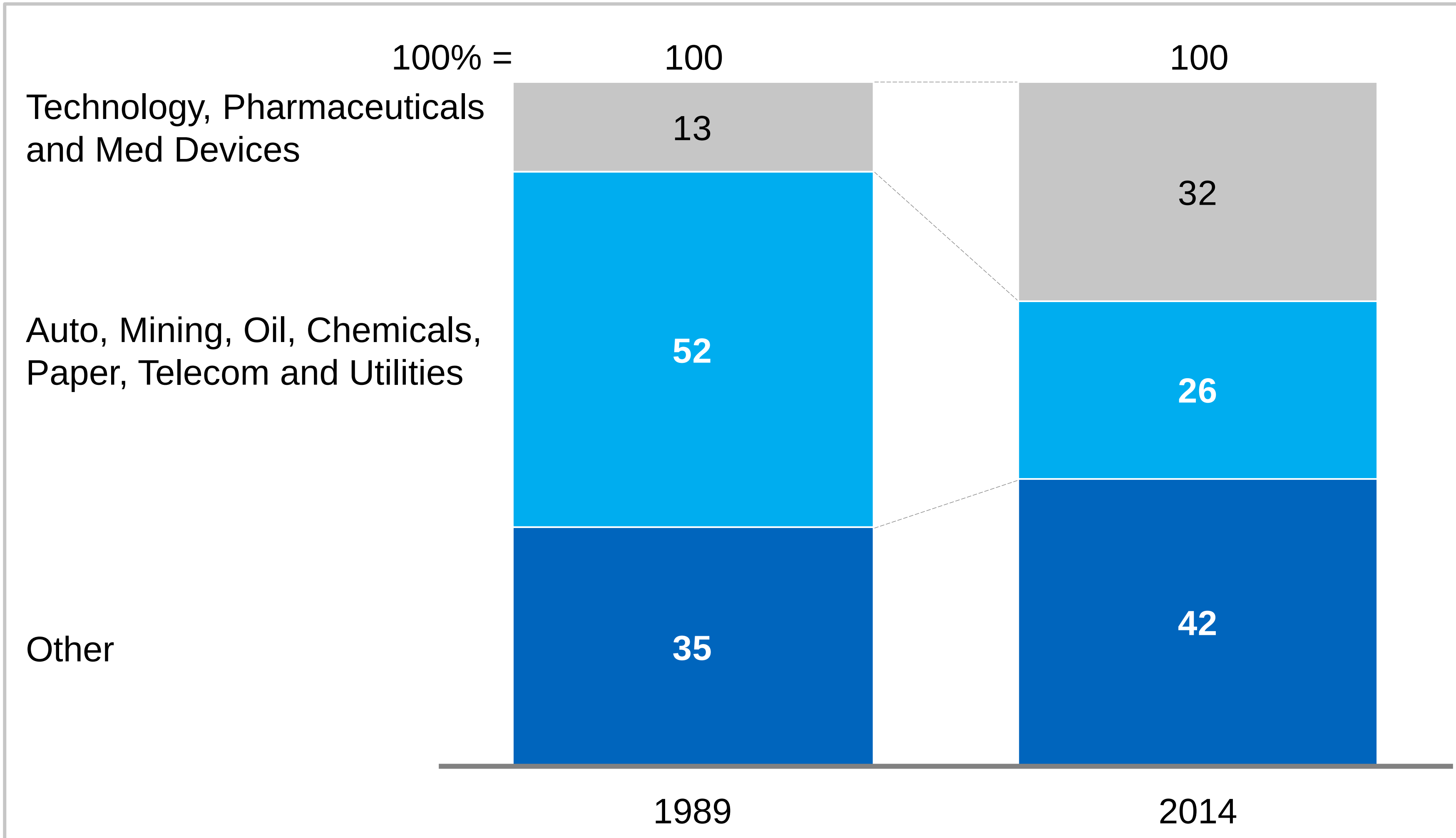


SOURCE: Source

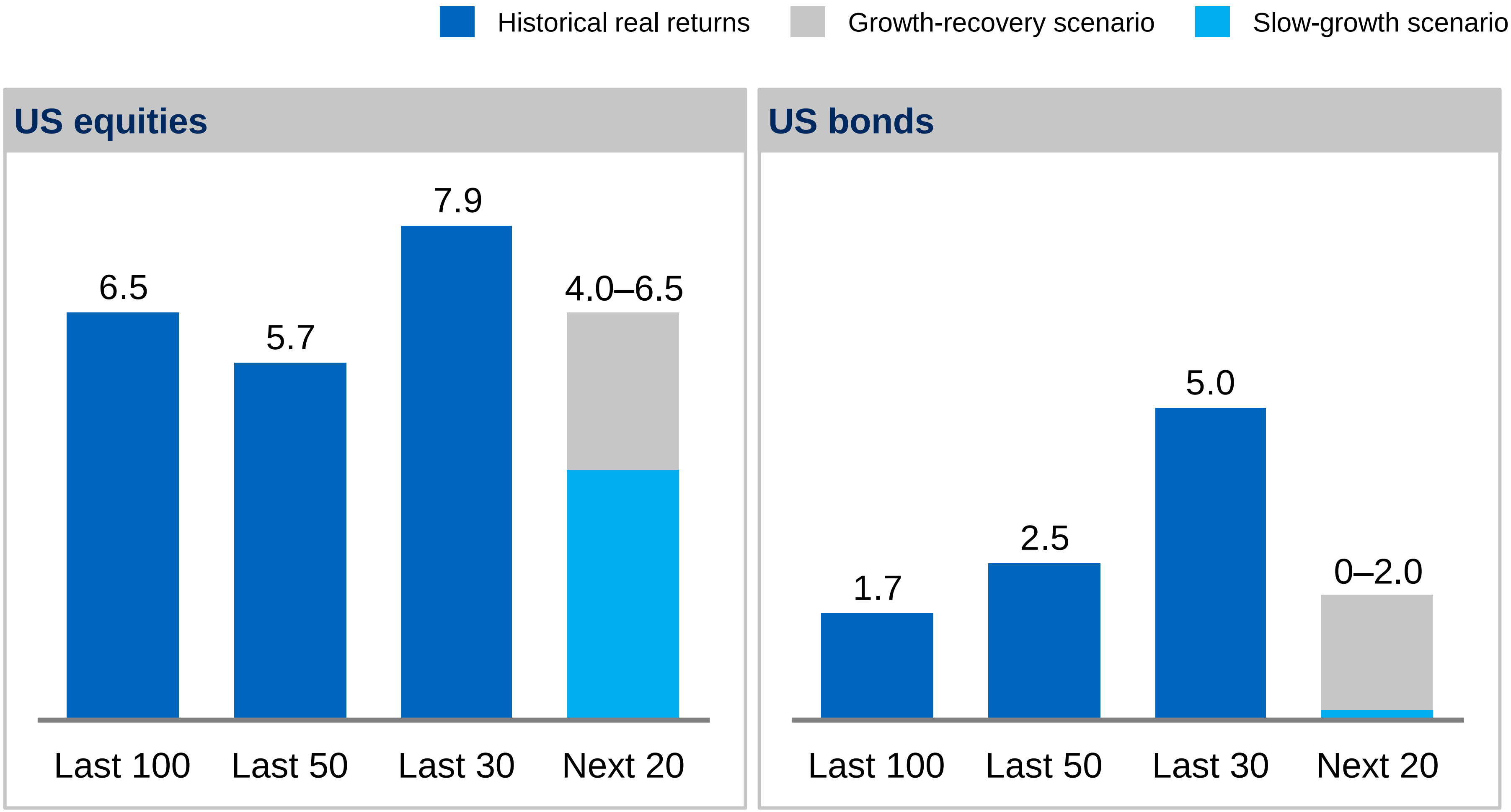
Significant shift in composition of US based companies led to higher profit margins

Share of total profits for US based companies

Percent

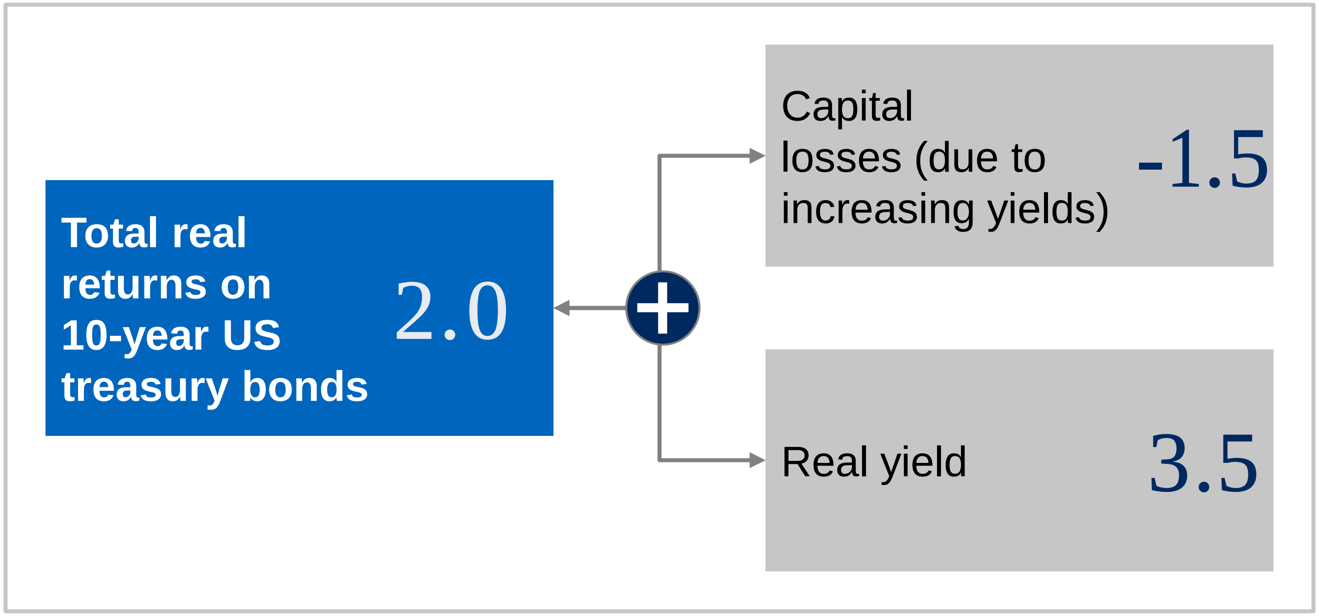


Returns over the next 20 years could be lower than long term averages



Future bond returns depressed by capital losses as interest rates return to typical levels

Potential bond returns next 20 years
Percent



Real economy factors driving future equity returns

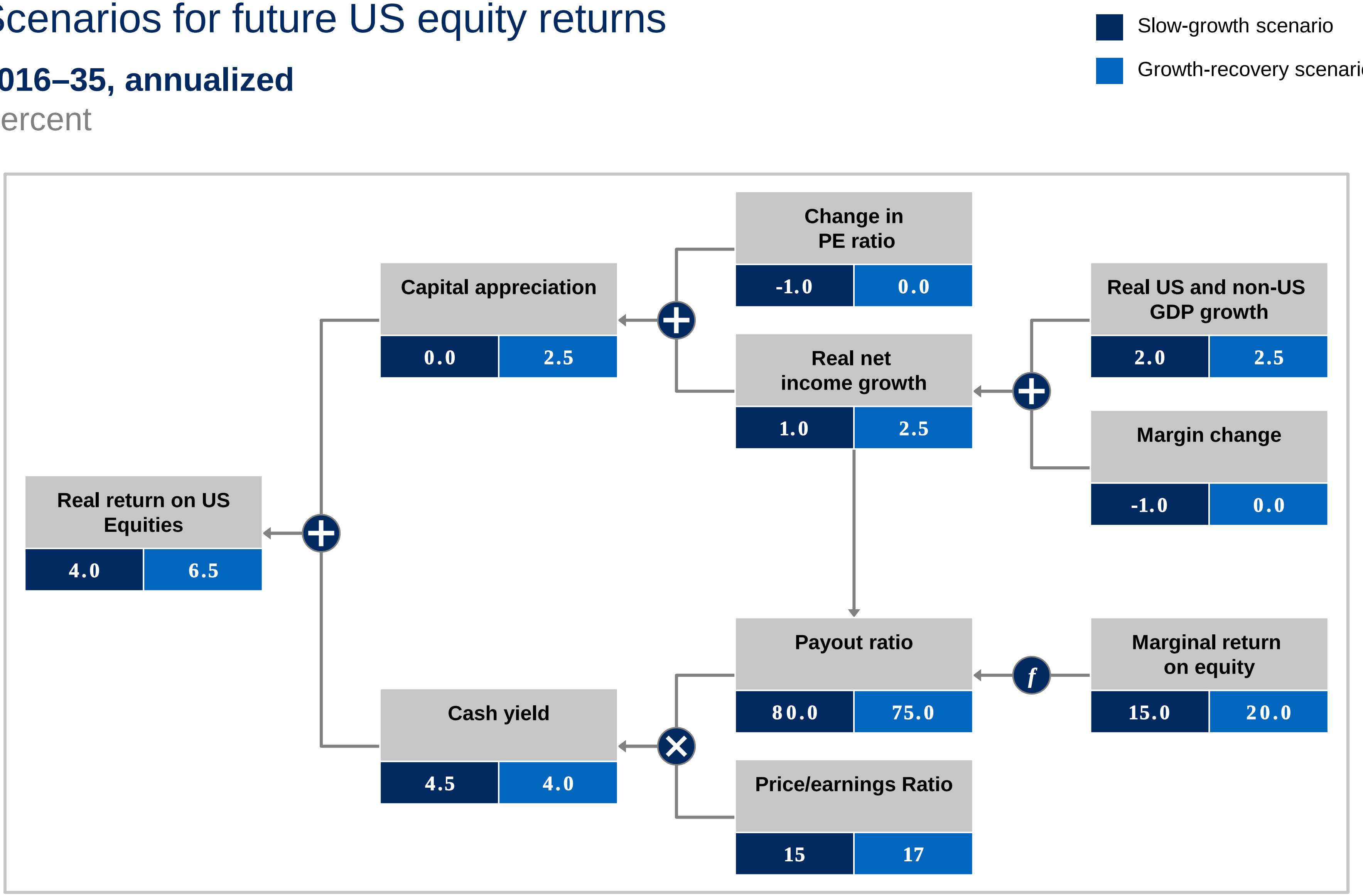
- No increase in P/E ratio
  - Inflation currently low
  - P/E ratios near “normal”
- Slower profit growth
  - Lower workforce growth
  - Lower productivity
  - Margins currently at all-time high
  - Potential pressures on future margins

SOURCE: Source

Scenarios for future US equity returns

2016–35, annualized

Percent

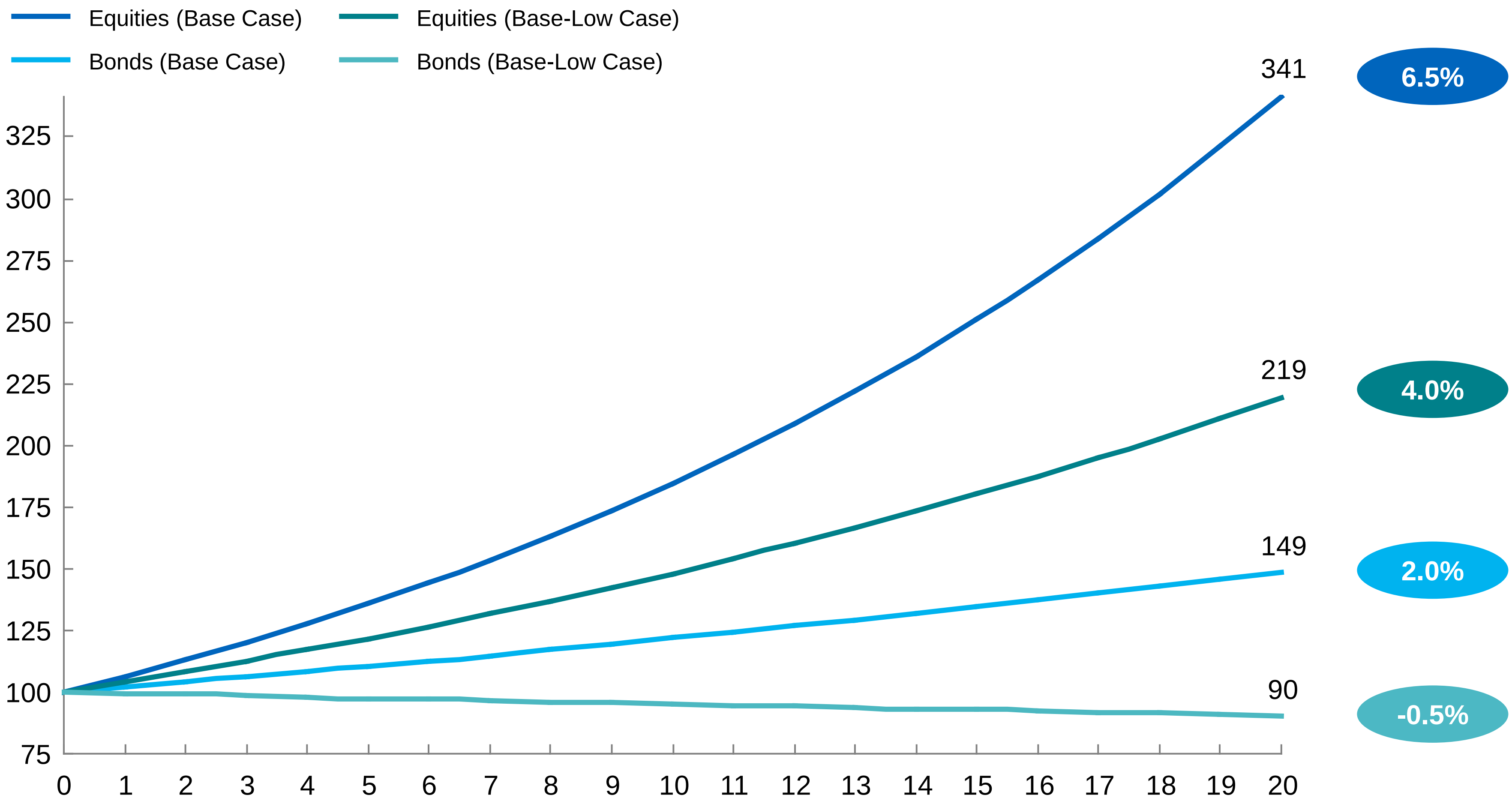


SOURCE: McKinsey Corporate Performance Analytics; McKinsey Global Institute analysis

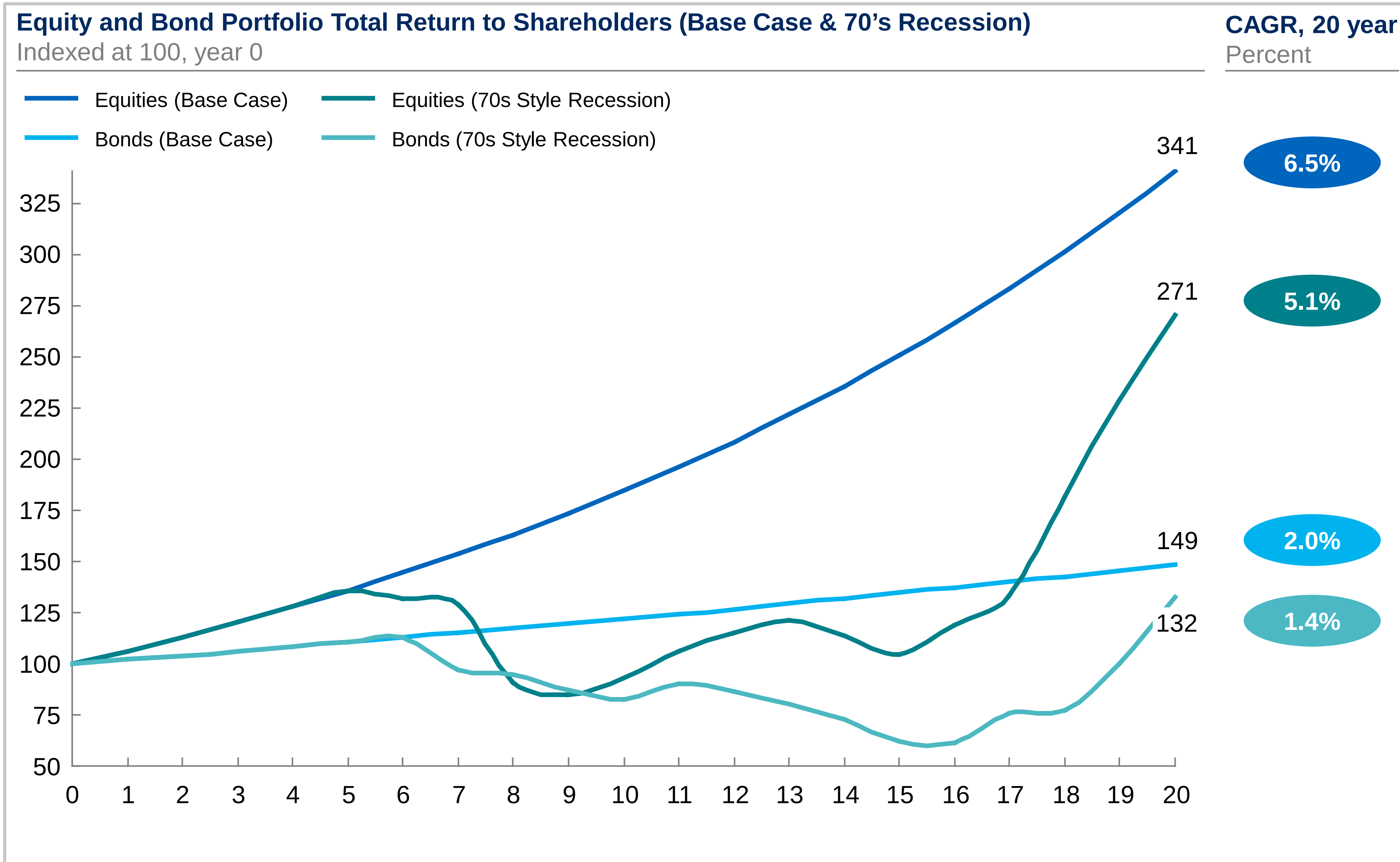
Scenario returns

Equity and Bond Portfolio Total Return to Shareholders (Base and Base-Low Case)
Indexed at 100, year 0

CAGR, 20 year
Percent



Total real return on equities higher than bonds even under a 1970's style recession

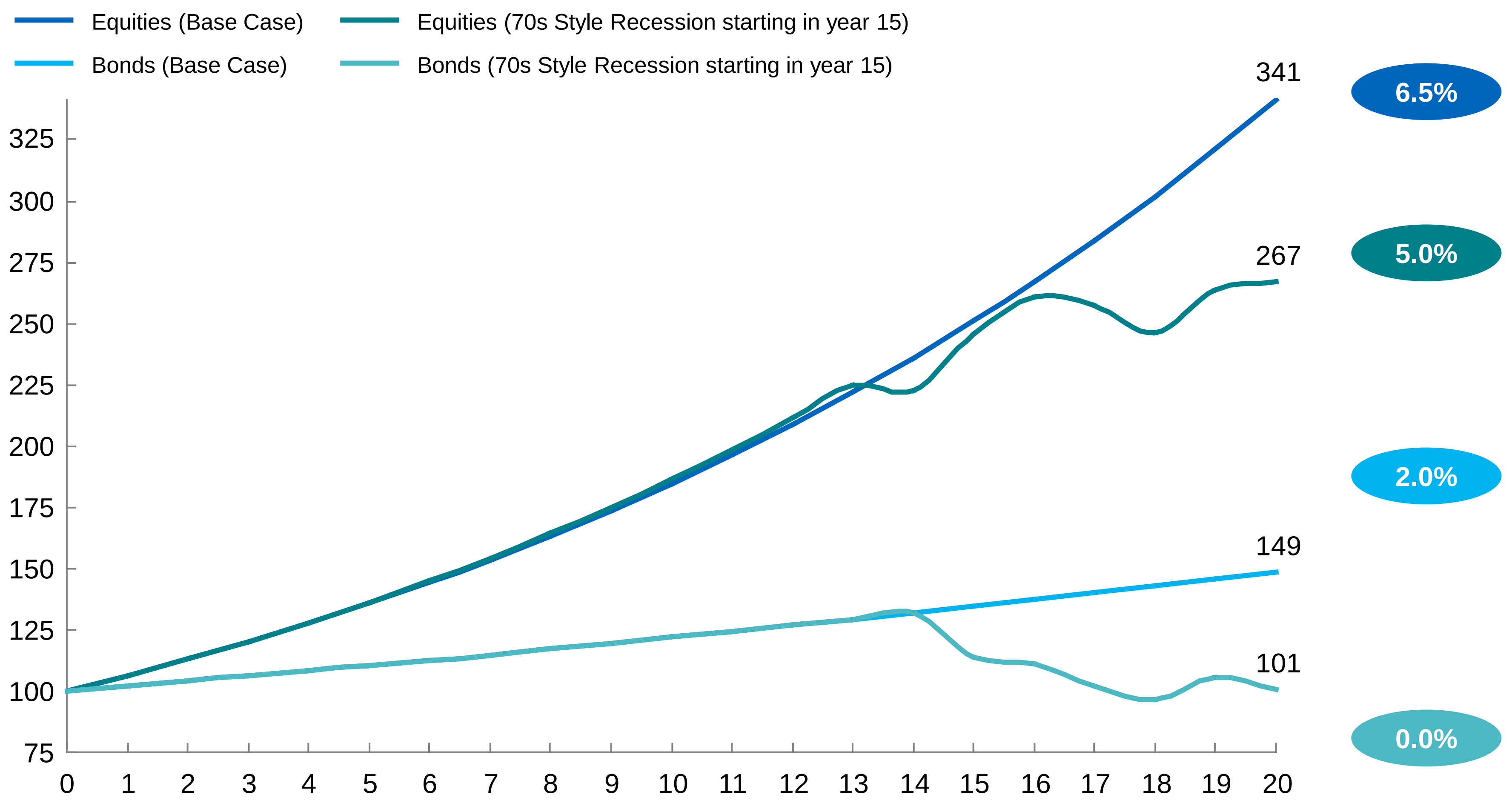


SOURCE: Corporate Performance Analytics, Bureau of Economic Analysis

Delay in 1970s style recession makes equities even more attractive

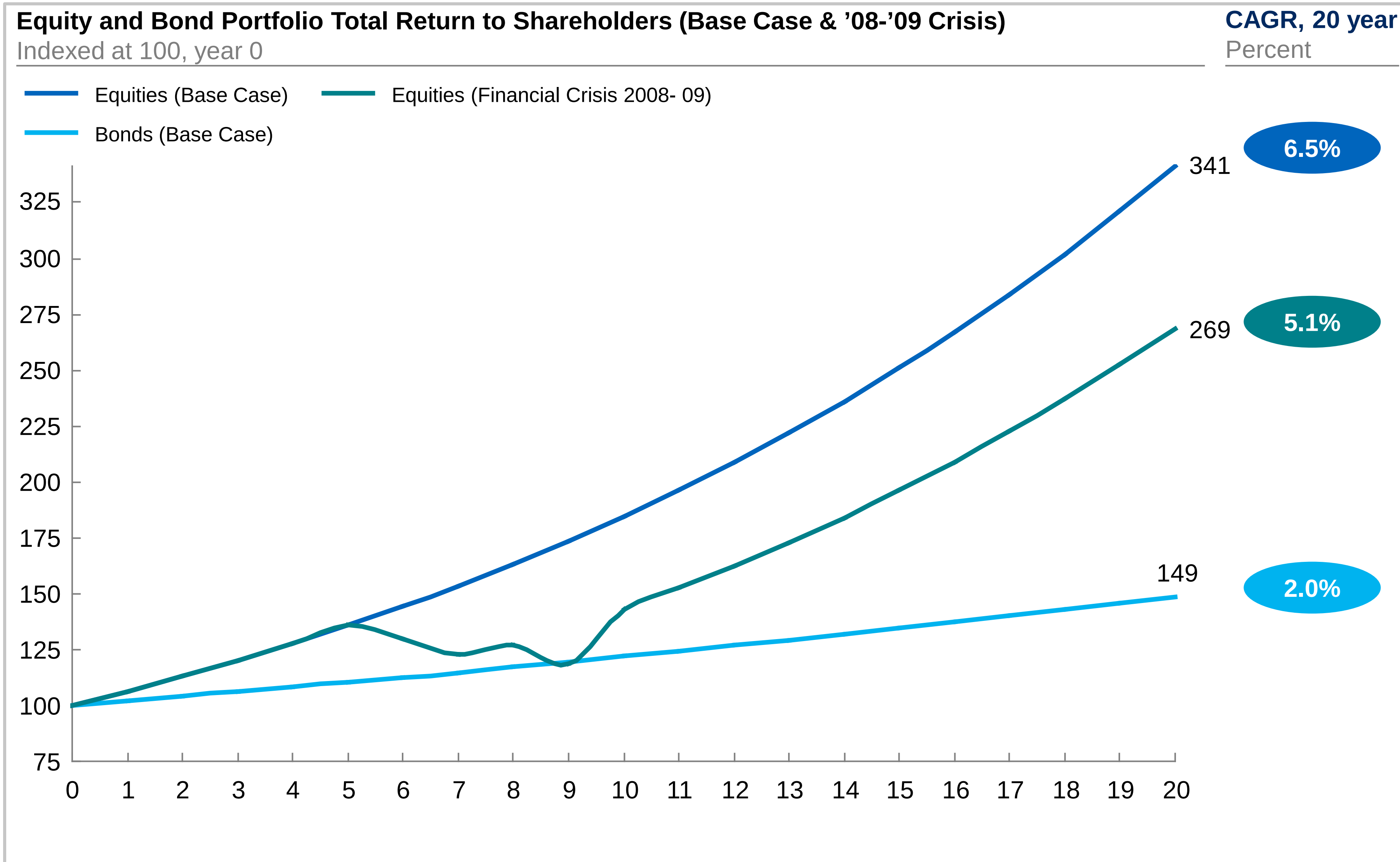
Equity and Bond Portfolio Total Return to Shareholders (Base Case & Delayed 70's Recession)
Indexed at 100, year 0

CAGR, 20 year
Percent



SOURCE: Corporate Performance Analytics, Bureau of Economic Analysis

Under a 2008-2009 financial crisis environment, equity returns remain higher than bond returns



SOURCE: Corporate Performance Analytics, Bureau of Economic Analysis

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SOURCE: Source