UNITED STATES OF AMERICA
BEFORE
THE FEDERAL ENERGY REGULATORY COMMISSION

Inquiry Regarding the Commission's Policy for Determining Return on Equity	))	Docket No. PL19-4-000

INITIAL COMMENTS OF THE EASTERN MASSACHUSETTS CONSUMER-OWNED SYSTEMS

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Bluefield Water Works & Improvement Co. v. Pub. Svc. Comm'n of W. Va., 262 U.S. 679, 693 (1923).....26, 31, 57

Boston Edison Co. v. FERC, 233 F.3d 60 (1st Cir. 2000).....65

Colorado Interstate Gas Co. v. FPC, 324 U.S. 581 (1945).....44

Conn. Dept. of Pub. Util. Control v. FERC, 593 F.3d 30 (D.C. Cir. 2010).....4

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Pennsylvania Pwr. Co. v. FPC, 343 U.S. 414 (1952)……3

Permian Basin Area Rate Cases, 390 U.S. 747 (1968)……19, 57

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Steadman v. SEC, 450 U.S. 91 (1981)……64

Tennessee Gas Pipeline Co. v. FERC, 926 F.2d 1206 (D.C. Cir. 1991)……10, 45, 72

Williston Basin Interstate Pipeline Co. v. FERC, 165 F.3d 54 (D.C. Cir. 1999)……49, 75, 81

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Alabama Public Service Commission, Docket Nos. 18117 and 18416, Order, 307 P.U.R.4th 291 (September 16, 2013)……52

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Bangor Hydro-Electric Co., 122 FERC ¶61,038 (2008)……42, 45, 57, 60

Bangor Hydro-Electric Co., 109 FERC ¶ 61,147 (2004)……76

Belmont Mun. Lt. Dept., et al. v. Cent. Me. Pwr. Co., et al., 156 FERC ¶ 61,198 (2016)……1

Boston Edison Co., Opinion No. 53, 8 FERC ¶ 61,077 (1979)……..…..8, 55

Cent. Me. Pwr. Co., 125 FERC ¶ 61,079 (2008)……..4

Coakley, et al. v. Bangor Hydro-Elec. Co., et al., Opinion No. 531, 147 FERC ¶ 61,234 (2014)……2, 7, 19, 21, 47

Coakley, et al. v. Bangor Hydro-Elec. Co., et al., Opinion No. 531-A, 149 FERC ¶ 61,032 (2014)……2

Coakley, et al. v. Bangor Hydro-Elec. Co., et al., Opinion No. 531-B, 150 FERC ¶ 61,165 (2015)……2, 21, 47

Coakley, et al. v. Bangor Hydro-Electric Co., 165 FERC ¶ 61,030 (2018)……*passim*

Coakley, et al. v. Bangor Hydro-Elec. Co., et al., 166 FERC ¶ 61,013 (2019)…..…..9, 29

Constellation Mystic Pwr., LLC, 165 FERC ¶ 61,267 (2018)……..…2

Consumer Advocate Div. of Pub. Serv. Comm'n of W. Va. v. Allegheny Generating Co., 67 FERC ¶ 61,288 (1994)……..……63, 65

Consumers Energy Co., 85 FERC ¶ 61,100 (1998)……..……8

ENE (Environment Northeast), 151 FERC ¶ 61,125 (2016)……..62

El Paso Natural Gas Company, 145 FERC ¶61,040 (2013)……..……38, 39

E. Tex. Elec. Coop. v. Pub. Svc. Co. of Okla., 166 FERC ¶ 61,020 (2019)……..…..2

Enbridge Pipelines, 100 FERC ¶61,260 (2002)……40

Generic Determination of Rate of Return on Common Equity for Public Utilities, Order No. 461, FERC Stats. & Regs. ¶ 30,722 (1987)……..…..*passim*

Generic Determination of Rate of Return on Common Equity for Public Utilities, Order No. 420, FERC Stats. & Regs. ¶ 30,644 (1985)……..…..28, 44, 55

Golden Spread Elec. Coop., Inc. v. Sw. Pub. Serv. Co., 151 FERC ¶ 61,126 (2015)……62, 65

ISO New England, Inc., 109 FERC ¶ 61,147 (2004)……18, 48

Kern River Gas Transmission Co., 126 FERC ¶61,034 (2009)……40

Louisiana Public Service Commission v. System Energy Resources, Inc., 124 FERC ¶ 61,003 (2008)……62

Midwest Ind. Trans. Sys. Operator, 106 FERC ¶ 61,302 (2004)……16

Minn. Pwr. & Lt., Opinion No. 12, 3 FERC ¶ 61,045 (1978)……8, 28

New Eng. Pwr. Co., 31 FERC ¶ 61,378 (1985)…… 14, 25, 50

New England Pwr. Co., 22 FERC ¶ 61,123 (1983)……29, 55

Northwest Pipeline Corp., 99 FERC ¶ 61,305 (2002)……15, 16

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Proxy Group Policy Statement, 123 FERC ¶61,048 (2008)……34

Pub. Svc. Co. of Indiana, Opinion No. 44, 7 FERC ¶ 61,319 (1979)……29

San Diego Gas & Elec. Co. v. Sellers of Energy and Ancillary Svcs., 149 FERC ¶ 61,116 (2014)……64

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Southern Company Services, Inc., 83 FERC ¶61,079 (1998)……63

Trailblazer Pipeline Co. LLC, 166 FERC ¶ 61,141 (2019)……2

Virginia Elec. Pwr. Co., 123 FERC ¶ 61,098 (2008)……50

Williston Basin Interstate Pipeline Co., 84 FERC ¶ 61,081 (1998)……16

Williston Basin Interstate Pipeline Co., 79 FERC ¶ 61,311 (1997)……49, 75, 81

Journal Articles

Alexander Robichek, "Regulation and Modern Finance Theory," Papers and Proceedings of the Thirty-Sixth Annual Meeting American Finance Association, New York City December 28-30, 1977, *Journal of Finance* 33 (June 1978)……..……9

Basil Copeland, "Alternative Cost-of-Capital Concepts in Regulation," *Land Economics* 54 (August 1978)……..……9

E. Brigham, D. Shome, and S. Vinson, "The Risk Premium Approach to Measuring a Utility's Cost of Equity," *Financial Management* (Spring 1985)……47

Ezra Solomon, "Alternative Rate of Return Concepts and Their Implications for Utility Regulation," *Bell Journal of Economics and Mgmt. Science* 1 (1970)……9

Frank Grubbs, "Sample criteria for testing outlying observations," *Annals of Mathematical Statistics* 21 (1950)……..19

Franklin Fisher and John McGowan, "On the Misuse of Accounting Rates of Return to Infer Monopoly Profits," *American Economic Review* 73 (March 1983)……9

J.C. Bonbright, A.L. Danielsen and D.R. Kamerschen*, Principles of Public Utility Rates* (Public Utility Reports, Inc. 2d ed., 1988)……..……10, 28

Kolbe, Reed, Jr. and Hall, *The Cost of Capital: Estimating the Rate of Return for Public Utilities* (1984)……8, 28, 44, 54

Morin, *New Regulatory Finance* (2006)……..8, 76, 84

Stewart Myers, "The Application of Finance Theory to Public Utility Rate Cases," *Bell Journal of Economics and Mgmt. Science* 3 (Spring 1972)……..9

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INITIAL COMMENTS OF THE EASTERN MASSACHUSETTS CONSUMER-OWNED SYSTEMS

The Eastern Massachusetts Consumer-Owned Systems ("EMCOS")[1] appreciate the opportunity to submit these Initial Comments in response to the Commission's Notice of Inquiry issued March 21, 2019 (84 Fed. Reg. 11,769 (March 28, 2019) (the "ROE NOI"). The EMCOS have participated as intervenors in the first three Section 206 complaint proceedings challenging the allowed return on common equity of the New England Transmission Owners ("NETOs"),[2] and were the Complainants in the most recent of those Section 206 proceedings.[3] From that

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[1] The EMCOS are Belmont Municipal Light Department ("Belmont"); Braintree Electric Light Department ("Braintree"); Concord Municipal Light Plant ("Concord"); Georgetown Municipal Light Department ("Georgetown"); Groveland Electric Light Department ("Groveland"); Hingham Municipal Lighting Plant ("Hingham"); Littleton Electric Light & Water Department ("Littleton"); Merrimac Municipal Light Department ("Merrimac"); Middleton Electric Light Department ("Middleton"); Reading Municipal Light Department ("Reading"); Rowley Municipal Lighting Plant ("Rowley"); Taunton Municipal Lighting Plant ("Taunton"); and Wellesley Municipal Light Plant ("Wellesley").

[2] The NETOs are Emera Maine (f/k/a Bangor Hydro Electric Company); Central Maine Power Company; Eversource Energy Service Company (f/k/a Northeast Utilities Service Company) on behalf of: The Connecticut Light and Power Company, NSTAR Electric Company, Western Massachusetts Electric Company, and Public Service Company of New Hampshire; New England Power Company d/b/a National Grid; New *Hampshire* Transmission LLC; The United Illuminating Company; Unitil Energy Systems, Inc. and Fitchburg Gas and Electric Light Company; and Vermont Transco LLC.

[3] *Belmont Mun. Lt. Dept., et al. v. Cent. Me. Pwr. Co., et al.*, 156 FERC ¶ 61,198 (2016) (hearing order).

vantage point, the EMCOS have observed firsthand the Commission's "grappl[ing] with whether the DCF model continues to produce ROEs for public utilities consistent with the *Hope* and *Bluefield* capital attraction standards.[4] We recommend in these comments that the Commission either modify or abandon the methodology for determining return on common equity ("ROE") that it first proposed on remand of Opinion No. 531[5] from the United States Court of Appeals in the Commission's October 16, 2018 Order Directing Briefs in *Coakley, et al. v. Bangor Hydro-Electric Co.*[6] ("*Coakley* Briefing Order") (the "Proposed Methodology").

EMCOS' experience as participants in each of the proceedings leading to the *Coakley* Briefing Order has given them useful insight into where the Proposed Methodology improves the Commission's ability to identify a just and reasonable ROE, and where the Proposed Methodology fails.[7] Fundamentally, EMCOS believes

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4 ROE NOI at P 18.

5 *Coakley, et al. v. Bangor Hydro-Elec. Co., et al.*, Opinion No. 531, 147 FERC ¶ 61,234 (2014), *order on paper hrg.*, Opinion No. 531-A, 149 FERC ¶ 61,032 (2014), *reh'g den.*, Opinion No. 531-B, 150 FERC ¶ 61,165 (2015), *vacated and remanded sub nom. Emera Maine v. FERC*, 854 F.3d 9 (D.C. Cir. 2017).

6 165 FERC ¶ 61,030 (2018). On November 15, 2018, the Commission issued a companion briefing order concerning its newly proposed ROE methodology in *Assn of Bus. Advocating Tariff Equity, et al. v. ALLETE, Inc., et al.*, 165 FERC ¶ 61,118 (2018), and Order Providing Guidance issued November 15, 2018 in *Ark. Pub. Svc. Comm'n v. System Energy Res., Inc.*, 165 FERC ¶ 61,119 (2018). Subsequently, the Commission has directed briefing on its *Coakley Briefing Order* ROE methodology proposal in other proceedings involving both public utility rates (*E. Tex. Elec. Coop. v. Pub. Svc. Co. of Okla.*, 166 FERC ¶ 61,020 (2019); *Constellation Mystic Pwr., LLC*, 165 FERC ¶ 61,267 at PP 31-34 (2018)) and gas pipeline rates (*Trailblazer Pipeline Co. LLC*, 166 FERC ¶ 61,141 (2019)).

7 EMCOS has fully briefed its concerns with the Proposed Methodology in Dockets No. EL11-66-000, EL13-33-000, EL14-86-000 and EL16-64-000.

the uncritical acceptance of non-DCF methodologies will result in the routine identification of ROEs that are excessive and harmful to the consumers the Federal Power Act is designed to protect. Before turning to the questions posed in the Commission's ROE NOI, we offer a brief overview of the shortcomings of the Proposed Methodology.

I. OVERVIEW

"It is long-established that the 'primary aim [of the FPA] is the protection of consumers from excessive rates and charges'" [8] and is intended "to afford consumers a complete, permanent and effective bond of protection from excessive rates and charges."[9] In the aftermath of the Great Recession, consumers began to challenge ROEs that continued to reflect pre-Great Recession capital market conditions and were therefore unjustly burdensome on consumers. Rather than apply its precedential ROE methodology, the Commission has now spent nearly eight years amending and completely recasting its methodology for identifying a just and reasonable utility ROE. This ever-shifting regulatory landscape has deprived

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[8] *Xcel Energy Svcs., Inc. v. FERC*, 815 F.3d 947, 952 (D.C. Cir. 2016), quoting *Mun. Lt. Bds. of Reading and Wakefield v. FPC*, 450 F.2d 1341, 1348 (D.C. Cir. 1971), *cert. denied*, 405 U.S. 989 (1972). *Accord: Pennsylvania Pwr. Co. v. FPC*, 343 U.S. 414, 418 (1952) ("A major purpose of the [Federal Power] Act is to protect consumers against excessive prices"); *NAACP v. FPC*, 520 F.2d 432, 438 (D.C. Cir. 1975) ("Of the Commission's primary task there is no doubt, however, and that is to guard the consumer from exploitation by non-competitive electric power companies"), *aff'd*, 425 U.S. 662.

[9] *Atl. Ref'g Co. v. Pub. Svc. Comm'n of NY*, 360 U.S. 378, 388 (1959). Because the Natural Gas Act and the Federal Power Act "are in all material respects substantially identical" (*FPC v. Sierra Pac. Pwr. Co.*, 350 U.S. 348, 353 (1956)), decisions interpreting the pertinent sections of the two statutes are cited interchangeably. *Ark. La. Gas Co. v. Hall*, 453 U.S. 571, 577 n. 7 (1981).

consumers, utilities, and investors of much needed guidance and stability. Unfortunately, as discussed in these comments, the Proposed Methodology includes numerous flaws which will lead to the setting of excessive and therefore unjust and unreasonable ROEs.

The unique factual background of the *Coakley* series of Section 206 complaints provides a compelling illustration of the Proposed Methodology's upward bias. The *Coakley* Briefing Order concludes with an illustrative application of its proposed new analytical paradigm which identifies 10.41% as the just and reasonable ROE for the NETOs.[10] For comparison, the following table sets out the results of the Proposed Methodology next to the corresponding results reached in Opinion No. 489 – the 2006 decision that set the NETOs' initial ROE determination.[11]

Table 1-Comparison of ROE Results of *Coakley* Briefing Order and Opinion No. 489

ICOE Results	*Coakley* (2018) Example	Opinion No. 489 (2006)
Study Period	October 2012-March 2013	July-December 2004
High ICOE	13.08%	13.1% (orig.)/13.5% (reh'g)
Low ICOE	7.51% (composite)	7.3% (DCF only)
Midpoint (ROE)	10.41% (composite)	10.4% (DCF only)
Cap on "Total" ROE	13.08% (composite)	13.5% (DCF only)

[10] 165 FERC ¶ 61,030 at PP 55-59.

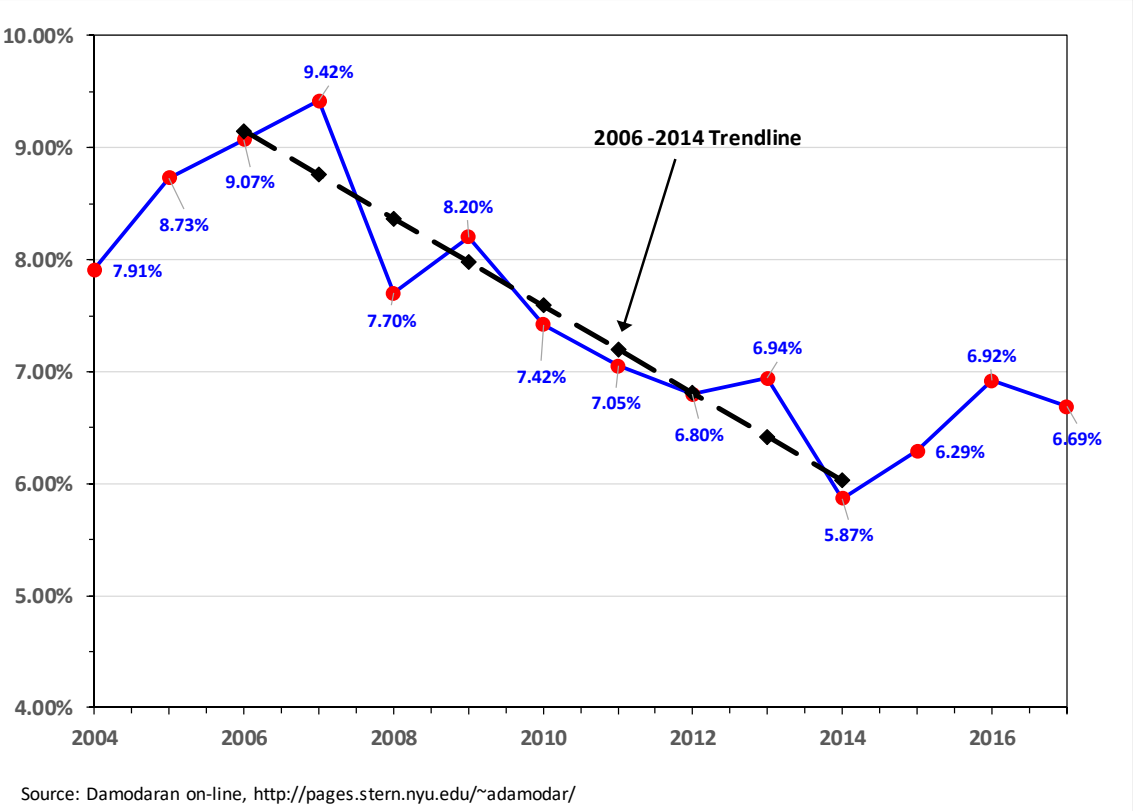
[11] *Bangor Hydro-Elec. Co.*, Opinion No. 489, 117 FERC ¶61,129 at P 80 (2006), *modified*, 122 FERC ¶ 61,265 at P 25 (2008) (establishing a range of implied costs of equity from 7.3 percent to 13.5 percent, with a midpoint of 10.4 percent), *review den. sub nom. Conn. Dept. of Pub. Util. Control v. FERC*, 593 F.3d 30 (D.C. Cir. 2010). *And see Cent. Me. Pwr. Co.*, 125 FERC ¶ 61,079 at P 72 n. 62 (2008) (explaining effect of rehearing on calculation of Opinion No. 489 range).

50 bp adder for RTO	Yes.	Yes.

The similarity of results is uncanny and perplexing when one realizes that the Great Recession, or what the Commission has described elsewhere as "the 2008 market collapse",[12] occurred between the two time periods reflected in the chart above. It is only possible to replicate results based on a 2004 study period with results based on a 2012-2013 study period by ignoring a great deal of economic upheaval that occurred between those two points. One reliable study, by New York University Stern School of Business Professor Aswath Damodaran, estimates that the weighted average cost of capital in the United States declined by 320 basis points between 2006 (when the Commission actually set the Opinion No. 489 ROE, after adding 74 basis points to the litigated 10.4 percent result based on changes in 10-year Treasury bond yields between the Initial Decision and the Commission decision) and 2014.

[12] *So. Cal. Edison Co.*, 147 FERC ¶ 61,240 at P 9 (2014).

Chart 1- US Weighted Average Cost of Capital Between 2004-2016



As the following table illustrates, the economic upheaval that followed the Great Recession led to substantial declines in numerous indicators of the cost of capital, and those declines are fundamentally inconsistent with the results produced in the Commission's illustrative application of its proposed *Coakley* Briefing Order methodology.

Table 2- Comparison of Change in Financial Indicators Between 2006 and 2014

Capital Cost Indicator	Opinion No. 489 (2006)	Opinion No. 531 (2014)	531 vs. 489
Study Period	July-Dec. 2004	Oct. 2012-Mar. 2013	
A-rated utility bond yield	5.85%	4.05%	(180 bp)
Baa-rated utility bond yield	6.05%	4.61%	(144 bp)
Ten-year Treasury yield	4.24%	1.83%	(241 bp)
Prime Interest Rate	5.25% (Dec. 2004)	3.25%	(200 bp)
US Wtd. Avg Cost of Capital (Damodaran)	9.07%	5.87%	(320 bp)

But all that the Commission's illustrative application of the proposed *Coakley* Briefing Order methodology accomplishes is the subtraction of the Commission's 2006 "update" increase of 74 basis points above the ROE result litigated based on a July to December 2004 study period.[13] The fact that the Proposed Methodology produces results that fail to reflect the impact of the Great Recession is illustrative of the upward bias embedded in the non-DCF methodologies. The primary force raising 2012-2013 implied costs of equity back up to 2004 levels is the *Coakley* Briefing

[13] The Commission itself abandoned this "update" adjustment in Opinion No. 531, concluding that "in light of the economic conditions since the 2008 market collapse more generally, U.S. Treasury bond yields do not provide a reliable and consistent metric for tracking changes in ROE after the close of the record in a case." 147 FERC ¶ 61,234 at P 160.

returns, and bears no relationship whatsoever to the market cost of equity capital. As the Expected Earnings analysis bears no relationship to the market cost of equity capital, the self-evident purpose for including it in the *Coakley* Briefing Order proposal is to inflate ROEs above the market cost of equity.

A. The Market Cost of Equity Capital Is the Just and Reasonable ROE

The Commission has long held that there is a "compelling economic justification for relying on the market cost of capital as the standard for rate of return decisions."[14] The *Coakley* Briefing Order recognizes that the market cost of equity capital should control.[15] However, this recognition is belied by the proposal to include the Expected Earnings analysis. The Expected Earnings analysis is based on "book" or accounting returns that bear no relationship to the market cost of equity capital. The Commission moved away from Expected Earnings in the early 1980s,[16] based in

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[14] *Generic Determination of Rate of Return on Common Equity for Public Utilities*, Order No. 461, FERC Stats. & Regs. ¶ 30,722, at 30,499 & n. 189 (1987), *citing* Kolbe, Reed, Jr. and Hall, *The Cost of Capital: Estimating the Rate of Return for Public Utilities* (1984) at 21.

[15] *See, e.g.*, *Coakley* Briefing Order, 165 FERC ¶ 61,030 at P 30.

[16] *Minn. Pwr. & Lt.*, Opinion No. 12, 3 FERC ¶ 61,045, 61,132 (1978) ("We are interested in forward looking analyses of the market's required rates of return"); *Boston Edison Co.*, Opinion No. 53, 8 FERC ¶ 61,077, 61,285 (1979) ("considering the vagaries of the stock market and the sensitivity of stock prices to such unpredictable factors as prevailing economic and market conditions, interest rates, investor confidence, international events, and inflation, it seems clearly beyond the capability of statistical analysis, however sophisticated, to calculate the precise return on common equity which will cause the price of a utility's stock to sell at or near its per share book value"); *Consumers Energy Co.*, 85 FERC ¶ 61,100, 61,362 (1998) ("no direct market-determined cost rate can be derived from this approach because the nature of the analysis is related to book values") (internal quotations omitted); Roger Morin, *New Regulatory Finance*, at 383 ("The historical book return on equity for regulated firms is not determined by competitive forces but instead reflects the past actions of regulatory commissions. It would be circular to set a fair return based on the past

significant part on substantial criticism of that methodology.[17] The Commission has yet to provide a reasoned explanation for its proposed shift in policy back to giving credence to accounting returns in determining ROE, or to respond to the many substantial and unanswered criticisms of the approach.

B. The DCF Analysis Remains Suitable for Public Utility ROEs

The Commission's expressions of discomfort with the DCF analysis[18] are heavily influenced by dubious versions of the non-DCF methodologies presented by witnesses on behalf of asset owners in the various complaint proceedings.[19] These upwardly biased applications of the non-DCF methodologies invited the Commission to accept that "anomalous" capital market conditions somehow uniquely impacted the predictive reliability of the DCF methodology. The proposition that one market-based

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actions of other regulators, much like observing a series of duplicate images in multiple mirrors").

17 *See, e.g.*, Ezra Solomon, "Alternative Rate of Return Concepts and Their Implications for Utility Regulation," *Bell Journal of Economics and Mgmt. Science* 1 (1970), at 65-81; Stewart Myers, "The Application of Finance Theory to Public Utility Rate Cases," *Bell Journal of Economics and Mgmt. Science* 3 (Spring 1972); Basil Copeland, "Alternative Cost-of-Capital Concepts in Regulation," *Land Economics* 54 (August 1978), at 348-361; Alexander Robichek, "Regulation and Modern Finance Theory," Papers and Proceedings of the Thirty-Sixth Annual Meeting American Finance Association, New York City December 28-30, 1977, *Journal of Finance* 33 (June 1978), at 693-705; Franklin Fisher and John McGowan, "On the Misuse of Accounting Rates of Return to Infer Monopoly Profits," *American Economic Review* 73 (March 1983), at 82-97, 85. Attached as Exhibit EMC-001.

18 165 FERC ¶ 61,030 at PP 40-48.

19 For example, the Commission's January 7, 2019 Order Granting Joint Motion for Disclosure in *Coakley, et al. v. Bangor Hydro-Elec. Co., et al.*, 166 FERC ¶ 61,013 (Appendix A) (2019) demonstrates that testimony on behalf of the New England Transmission Owners was the source of most of the data points used to develop the graph that appears as Figure 2 in the *Coakley* Briefing Order.

methodology (the DCF) is somehow uniquely disabled, while other market-based methodologies (the Capital Asset Pricing Model ("CAPM") and the Risk Premium analysis) are not, is untenable. The Commission's previous invocation of "model risk" as the cause of systematic underestimates, and its inability to identify either the causes or mechanisms by which this alleged "model risk" operates is telling, as it reveals a fundamental misunderstanding of basic finance and economics, and requires a presumption that markets are *inefficient*. If truly believed, that alternative to the efficient market hypothesis means that opportunities for unlimited arbitrage exist, awaiting exploitation by investors, including members of the Commission.[20]

DCF results are either input values for, or share inputs with, the CAPM and Risk Premium analyses. Thus, whatever impacts the DCF will affect these other market-based methodologies as well. The notion that the DCF somehow uniquely underestimates the market cost of equity capital[21] cannot be reconciled with the Efficient Market Hypothesis,[22] or with the fact that the DCF is either an input into

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20 *Tennessee Gas Pipeline Co. v. FERC*, 926 F.2d 1206, 1211 (D.C. Cir. 1991) ("if the stock market is such a laggard as the members of the Commission say, they would do well to abandon their regulatory work and turn to exploitation of their theory. …That investors can have been so obtuse as to miss this opportunity-and thus compete away the resulting profits-strains credulity.")

21 *Coakley* Briefing Order at PP 40-48.

22 *Tennessee Gas Pipeline Co.,* 926 F.2d at 1210-1212 (D.C. Cir. 1991). *And see Ill. Bell Tel. Co. v. FCC*, 988 F.2d 1254, 1259 n. 6 (D.C. Cir. 1993) ("The DCF method 'has become the most popular technique of estimating the cost of equity, and it is generally accepted by most commissions. Virtually all cost of capital witnesses use this method, and most of them consider it their primary technique,'" quoting J.C. Bonbright, A.L. Danielsen and D.R. Kamerschen*, Principles of Public Utility Rates* (Public Utility Reports, Inc. 2d ed., 1988), at 317-18.

(CAPM), or shares inputs with (Risk Premium); the market-based non-DCF models the *Coakley* Briefing Order proposes to incorporate into the Commission's ROE analysis. To the extent that the acuity of the DCF methodology has somehow become compromised, basic economic logic requires that the other market-based methodologies, if properly performed, would suffer from the same infirmity.[23] However, the Commission has thus far failed to confront this fact, or to identify the mechanism through which it believes the DCF has been disabled.[24] The Commission's simultaneous assertion that "anomalous" capital markets introduced such a systematic bias, while asserting that there is no need to understand either the underlying mechanism(s) of that claimed bias or the magnitude of the claimed underestimation, is simply not reasonable.

C. The CAPM and Risk Premium Model Applications on Which the *Coakley* Briefing Order and This NOI Rely Are Unsound

As discussed above, a just and reasonable ROE must reflect the market cost of capital. Therefore, the Commission should only consider market-based methodologies such as the DCF, CAPM, and Risk Premium. While the DCF remains sound, should the Commission desire to expand its reliance beyond a single

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[23] The Commission's conclusion (*ABATE v. MISO*, Opinion No. 551, 156 FERC ¶ 61,234 at P 131 (2016)) that "The finding that mechanical application of the DCF methodology may produce results inconsistent with *Hope* and *Bluefield* in certain circumstances is not inconsistent with the efficient market theory underlying the typical application of the DCF methodology in normal circumstances" does not explain how the CAPM and risk premium methodologies remain unaffected by whatever is supposed to be affecting the DCF analysis.

[24] *Id*.

methodology, correct application of the CAPM or Risk Premium methodology is essential. However, the CAPM and Risk Premium methodologies reflected in the Proposed Methodology have not been critically examined and contained numerous flaws rendering them unreliable. The Commission has recognized these flaws, holding:[25]

- "Although we require more precision from our DCF model—as the primary financial model that we use, and have used for decades, to determine public utility ROEs—that same degree of precision is less essential in the CAPM analysis because that analysis is but one of multiple pieces of evidence corroborating the results of our DCF analysis."[26]

- ". . . [W]e are not relying on the risk premium analysis to set the ROE itself. Instead, we find that MISO TOs' risk premium analysis is sufficiently reliable to corroborate our decision to place MISO TOs' base ROE above the midpoint of the zone of reasonableness produced by the DCF analysis."[27]

Neither the *Coakley* Briefing Order nor this NOI address the Commission's concerns, despite the fact that the Proposed Methodology seeks to use identical applications of the CAPM and Risk Premium to actually set the ROE itself. Such a failure is the hallmark of unreasoned decision making.

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[25] For reasons discussed elsewhere, the Expected Earnings approach should not be considered. However, should the Commission include that methodology, it must address its recognition that "The expected earnings analysis, like the other alternative methodologies accepted herein, is merely used as corroborative evidence. Therefore, we are not persuaded that our acceptance of the expected earnings analysis, which at most can corroborate the Commission's decision to place an ROE above the midpoint of the zone of reasonableness, will raise issues of circularity or lead to a convergence of Commission-approved ROEs to the Value Line projections." Opinion No. 551, 156 FERC ¶61,234 at P 232.

[26] *Id.* at P 168.

[27] *Id.* at P 194.

Specifically, in the context of the CAPM, the Proposed Methodology seeks to adopt the use of a simplified single-stage, constant growth DCF "analysis" of the S&P 500. The approach does not screen for unsustainable shorter-growth growth rates that are presumed to continue forever, in calculating the market return component of their CAPM analyses. This inevitably and predictably overstates the CAPM's estimated return on equity. Failure to use a two-stage DCF multiplies the effect of this misapplication, by assuming that the unrealistically high growth rates produced by the first misapplication will continue in perpetuity. These misapplications of the CAPM analysis substantially overstate the market return component of the CAPM. The resulting overstatement of the return calculated by this particular misapplication of that methodology is then incorrectly used as evidence to suggest that Commission's DCF analysis understates the market cost of equity.

The variant of "Risk Premium" analysis on which the Commission has relied in past cases and in the *Coakley* Briefing Order is based on regression analyses of historical allowed returns on equity set by regulators versus utility bond yields. There are at least five fundamental problems with this approach. First, as the Commission itself has observed, capital market conditions since the market collapse of 2008 cast doubt on both the direction and the magnitude of any correlation between Treasury bond yields and return on equity – an observation that applies with equal force to the direction and magnitude of any correlation between utility bond rates and return on equity. Second, as the Commission itself has observed, "[t]here is no direct relationship between historical risk premiums and a current cost of equity under

constantly changing financial conditions[.]"[28] Third, the use of regressions between bond yields and historical allowed returns to set the equity risk premium ignores comparable risk,[29] and thus fails to implement a fundamental requirement of *Hope* and *Bluefield*. Rather than reflecting current capital market conditions, and the business and financial risk of the proxy group of companies, this Risk Premium approach boils down to selecting a desired historical period to derive whatever Risk Premium result one wants. Fourth, there is no support whatsoever in the academic finance and economics literature for using such regressions to estimate an allowed ROE. Fifth, the number of actual observations establishing an ROE in the data set used in the regression analyses on which the Commission's proposed version of a Risk Premium relies is far too limited to support a statistically valid study.[30]

Each of the above discussed summaries illustrates the need for critical examination of any methodology that the Commission decides to place on equal

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28 *New Eng. Pwr. Co.*, 31 FERC ¶ 61,378, 61,841 (1985).

29 Proponents of the FinCap "risk premium" methodology referenced in the *Coakley* Briefing Order might argue that business and financial risk is incorporated by basing the Risk Premium estimate on the average bond yield corresponding to the average bond rating of the company or companies under study. This is false. If the yield spread remains relatively constant between A-rated and BBB-rated utility bonds, then the only change in the regression parameters will be an increase in the constant term equal to the average difference in the yield spreads. The estimated coefficient on the bond yield will not change, or change only marginally. Hence, the resulting "adjustment" to the equity risk premium will be identical and the resulting RP estimates will be the same.

30 *See* Docket No. EL16-64-002 EMCOS Initial Brief on Paper Hearing at 41-42; Exhibit EMC-0400 at P 119 (Jan. 11, 2019) (Showing that of the 104 Commission orders referencing the expression of "ROE" over the period between 2006 and 2016, 64 were approving settlement in which the exchange of value among the parties is inherently unknowable. Of the remaining 40 orders referenced, only 15 actually involved setting a return on equity).

footing as the DCF. The precision of the Commission's DCF methodology is the result of the Commission's and parties' searching inquiry of that methodology over the more than three decades that it has been the primary model upon which the Commission has relied. Neither the CAPM nor the Risk Premium has been subjected to a similar review nor has the Commission adopted the necessary guidelines to ensure the methodologies are applied consistently and correctly.

D. Reliance on End Point-Driven Results Requires Exclusion of Outliers

The *Coakley* Briefing Order proposes (at P 17 n. 46) to continue to use the midpoint of a range of implied costs of equity to establish the just and reasonable ROE for a diverse group of utilities. However, the considerations proffered to justify the Commission's use of the midpoint to set the ROE for a group of utilities providing a shared service have been overtaken by use of national proxy groups and the introduction of the Commission's "one-notch" credit screen for potential proxy group members. As a result, the rationales previously advanced for preferring the midpoint of the range of implied costs of equity over the median as the appropriate measure of central tendency for use in identifying a just and reasonable ROE for a diverse group of utilities lack persuasive force.

The Commission has recognized and repeated consistently that the median is a more statistically robust measure of central tendency[31] and gives "consideration to

[31] *Northwest Pipeline Corp.*, 99 FERC ¶ 61,305, at 62,276 (2002); *See also S. Cal. Edison Co.*, 131 FERC ¶ 61,020, at PP 85-86 (2010).

more of the companies in the proxy group."[32] In *Northwest Pipeline Corp.* the Commission explained:

> The median best represents central tendency in a skewed distribution over the mean because the latter is drawn in the direction of the skew more than the median. That is, in a very positively skewed distribution, the mean will be higher than the median. In a very negatively skewed distribution, the mean will be lower than the median. These statistical facts make the median an appropriate average to use to represent the typical observation in a skewed distribution because it is less affected by extreme numbers than the mean. Similarly, the median is also less affected by extreme numbers than the midpoint in a skewed distribution. Since the midpoint is the average of the highest and lowest numbers in the group, it is clearly subject to distortion by extremely high or low values.[33]

In *Midwest Ind. Trans. Sys. Operator* ("*Midwest ISO*") the Commission relied on the midpoint of a regional proxy group on the basis that using the midpoint as the single regional base ROE would ensure the region's least- and most-risky utilities were considered.[34] Thus under these "unique … circumstances" where "the proxy group used to define the range of reasonableness … consist[ed] of a subset of the Midwest ISO TOs to which the ROE will actually apply,"[35] the midpoint rationally "emphasize[d] the endpoints of the proxy group range, ensuring that outlier as well as average TOs receive just and fair compensation."[36]

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[32] *Williston Basin Interstate Pipeline Co.*, 84 FERC ¶ 61,081, 61388-61389 (1998).

[33] 99 FERC ¶61,305, 62,276 (2002).

[34] 106 FERC ¶ 61,302 (2004) ("*MISO*"), *aff'd in relevant part sub nom. Pub. Serv. Comm'n of Ky. v. FERC*, 397 F.3d 1004 (D.C. Cir. 2005) ("*PSCKY*").

[35] *MISO*, 106 FERC ¶61,302 at P 9.

[36] *PSCKY*, 397 F.3d at 1008 (summarizing *MISO* at 62,192-93).

The reasoning underpinning the *Midwest ISO* decision is no longer persuasive. First, the Commission has moved to routinely using a national proxy group specifically to address *Hope* and *Bluefield*'s capital attraction requirements.[37] Second, the screening criteria in the *Midwest ISO* proceeding did not include a limit that proxy group members must have bond ratings within one notch of those utilities whose ROE was at issue. Accordingly, these two changes address the considerations that the Commission raised in *Midwest ISO* as grounds for reliance on the midpoint rather than the median of a range of implied costs of equity for placement of the just and reasonable ROE. The Commission should therefore use the median for identifying the just and reasonable ROE for diverse groups of utilities, as well as individual ones.

Despite these changes, the *Coakley* Briefing Order proposes continued use of the midpoint. In the *Coakley* Briefing Order, the Commission states that it "proposes to treat as high-end outliers any proxy company whose cost of equity estimated under the model in question is more than 150 percent of the median result of all of the potential proxy group members in that model before any high or low-end outlier test is applied, subject to a 'natural break' analysis similar to the approach the Commission uses for low-end DCF analysis results."[38]

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[37] *Coakley* Briefing Order at P 49; Opinion No. 531, 147 FERC ¶61,234 at PP 96, 100-102.

[38] *Coakley* Briefing Order, 165 FERC ¶ 61,030 at P 53.

On the one hand, the proposal for an exclusion threshold for high-end outliers is a step forward.[39] Until the *Coakley* Briefing Order, the Commission had not provided any further content to the expression "threshold tests of economic logic" in the context of outliers. Its attempt at formulating a general test in the *Coakley* Briefing Order represents an incremental improvement over perpetual reference to values found too extreme in a fifteen-year old decision made in a very different economy.[40]

However, the 150-percent-of-unadjusted-median test is itself arbitrary. There is no evident basis for the choice of the 150 percent threshold. The Commission's suggestion that "[t]his test should identify those companies whose cost of equity under the model in question is so far above the cost of equity of a typical proxy company as to suggest that it is the result of atypical circumstances not

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[39] In practice, the Commission has referenced its observation in its 2004 RTO formation rehearing order in *ISO New England, Inc.*, 109 FERC ¶ 61,147 at P 205 (2004) as though the implied cost of equity and growth rate specifically referenced in that passage were somehow absolute and immutable values:

> . . . [W]e find PPL should be excluded from the Proxy Group because its 17.7 percent cost of equity is an extreme outlier and the inclusion of this number in the calculation in an unreliable ROE that will skew the results. . . . [I]t is often necessary to eliminate illogical results from cost of equity estimates that fail to meet threshold tests of economic logic. We believe a 13.3 percent growth rate is not a sustainable growth rate over time and therefore does not meet threshold tests of economic logic.

[40] *ISO New England, Inc.*, 109 FERC ¶ 61,147 at P 205 (2004) (Identifying a 17.7% cost of equity and 13.3% growth rate as outliers.)

representative of the risk profile of a more normal utility"[41] offers no explanation why a higher or lower threshold would not accomplish the same objective.

Dispersion matters in statistics. The Court's observation in *Emera Maine*, 854 F.3d at 28 that the midpoint-of-the-upper-half in Opinion No. 531 was higher than 35 of 38 implied cost of equity observations in the Commission's DCF analysis underscores one source of skepticism about the Commission's logic in that case. The fact that the 10.41 percent ROE value reached in the *Coakley* Briefing Order's illustrative application of its proposed analysis[42] is higher than 34 of 38 implied cost of equity observations in the Commission's Opinion No. 531 DCF analysis[43] suggests that the "end result" by which the new paradigm will be judged[44] differs little from the end result rejected in *Emera Maine.*

The discipline of statistics offers a number of well-known and readily applied screens for high-end outliers. The Grubbs Test[45] lends itself particularly well to ROE analysis precisely because it examines dispersion within a sample by comparing the

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41 *Coakley* Briefing Order, 165 FERC ¶ 61,030 at P 53.

42 165 FERC ¶ 61,030 at PP 54-59.

43 Opinion No. 531, 147 FERC ¶ 61,234, Appendix.

44 *Permian Basin Area Rate Cases*, 390 U.S. 747, 791-792 (1968) ("The Commission . . . is . . . obliged at each step of its regulatory process to assess the requirements of the broad public interests entrusted to its protection by Congress. Accordingly, the 'end result' of the Commission's orders must be measured as much by the success with which they protect those interests as by the effectiveness with which they 'maintain . . . credit and . . . attract capital'"); *FPC v. Hope Natural Gas Co.*, 320 U.S. 591, 603 (1944).

45 Frank Grubbs, "Sample criteria for testing outlying observations," *Annals of Mathematical Statistics* 21 (1950), at 27–58.

highest (or lowest) value in a sample to the sample average (mean) and measures the largest absolute deviation from the sample mean in units of the sample's standard deviation. The Commission should select a recognized, statistically valid screen for high-end outliers and require its consistent application.

E. The *Coakley* Briefing Order "Step One" Analysis Is Unsound

The *Coakley* Briefing Order misreads and misapplies *Emera Maine's* criticism of Opinion No. 531 for failing to explain why it found the existing ROE in that case to be unjust and unreasonable – the threshold inquiry under FPA Section 206(a).[46] In place of the required explanation, which could readily be supplied by reference to decreases in the market cost of equity capital between the July through December 2004 study period involved in Opinion No. 489 and the October 2012 to March 2013 study period at issue in Opinion No. 531, the *Coakley* Briefing Order proposes a "quartiles" approach.

The *Coakley* Briefing Order's proposal to use "zone of reasonableness quartiles" in assessing the justness and reasonableness of existing ROEs addresses neither financial impacts on consumers nor other, non-monetary factors that may impact the justness and reasonableness of an existing allowed ROE. In addition, just as the Commission strives to avoid "mechanical application" in determination of just and

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[46] *Emera Maine v. FERC*, *supra*, 854 F.3d at 28-29 ("FERC concluded that the existing 11.14 percent base ROE was unlawful solely because it had determined that 10.57 percent, which was "a numerical value below the existing numerical value," was a just and reasonable base ROE. . . . That conclusion, without any further explanation, is insufficient to prove that Transmission Owners' existing base ROE was unlawful") (internal citations omitted).

reasonable ROEs,[47] the mechanical application of these "zone of reasonableness quartiles" as proposed by the October 16 Order will create inherent contradictions, in which the averaging procedure by which the October 16 Order proposes to set an allowed ROE can result in an allowed ROE value that falls outside the zone of presumptive compliance with the just-and-reasonable standard. In such a circumstance, it is not clear how both the existing allowed ROE and the updated allowed ROE would be evaluated.

The *Coakley* Briefing Order's "quartile" proposal offers no explanation of the relationship of the proposal to the existence or absence of just and reasonable levels of ROE. The October 16 Order's "quartile" proposal appears to create a "zone of immunity" for levels of ROE that exceed the just-and-reasonable level. As in the Paragraph 57 example outlined above, the "quartile" proposal appears to immunize an ROE of up to 10.99 percent from challenge under FPA Section 206, even though the ultimate just-and-reasonable ROE is 10.41 percent – 58 basis points lower, which translates to a substantial amount of after-tax return in the context of RTO transmission arrangements. Such a result would be inconsistent with the Commission's previous explanation of its Section 206 scrutiny in *Bangor Hydro-Electric Co.*, 122 FERC ¶ 61,038 at PP 10-14 (2008), and the Court of Appeals' holding in *Emera Maine*, 854 F.3dat 23-24 that "[n]either the language of the FPA nor our precedents compel FERC to accept all rates within the . . . zone of reasonableness as

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[47] Opinion No. 531, 147 FERC ¶ 61,234 at PP 150-152 (2014), *rehearing denied*, Opinion No. 531-B, 150 FERC ¶ 61,165 at PP 36, 50 (2015), *remanded sub nom. Emera Maine v. FERC*, 854 F.3d 9 (D.C. Cir. 2017).

just and reasonable in a section 206 proceeding." It would also be inconsistent with longstanding judicial precedent holding that the FPA does not tolerate "even a little" deviation from the just and reasonable standard.[48]

II. COMMENTS

With the foregoing discussion as background, the EMCOS now offer responses to seven of the eight groups of questions specifically posed in the Commission's ROE NOI. These groups of questions are: (A) the role of the Commission's base ROE in investment decision-making and what objectives should guide Commission's approach; (C) performance of the DCF model, (D) proxy groups; (E) financial model choice; (F) mismatch between market-based ROE determinations and book-value rate base; (G) how the Commission determines whether an existing ROE is unjust and unreasonable under the first prong of the FPA § 206; and (H) model mechanics and implementation.

A. Role and Objectives of Commission's Base ROE Policy

Commission Questions:

A.1. To what extent would the ROE methodology described in the *Coakley* and MISO Briefing Orders impact the predictability of ROE determinations and the costs for market participants of making or intervening in such proceedings?

A.2. How would using the ROE methodology described in the *Coakley* and MISO Briefing Orders affect an investor's ability to forecast the ROE the Commission

[48] *Farmers Union Cent. Exch. v. FERC*, 734 F.2d 1486, 1508 (D.C. Cir. 1984), quoting *FPC v. Texaco Inc.*, 417 U.S. 380, 399 (1974).

would establish in a litigated proceeding and the ability of participants to propose, contest, and settle base ROEs as compared to using only the DCF methodology?

EMCOS Responses:

The multiple-model approach proposed in the *Coakley* briefing order multiplies both litigation costs and outcome uncertainty by creating complexity without contributing to the identification of a just-and-reasonable ROE. The Commission's prior DCF based methodology included well established protocols and procedures for how to perform the required analysis. The requirements of the methodology were well known to potential complainants, utilities, and investors alike which enabled all interested parties to make good faith estimates of where a Commission decision would likely land.

By contrast, the Proposed Methodology would require interested parties to conduct *four* methodologies, three of which (the CAPM, Risk Premium and Expected Earnings) lack the detailed guidelines for implementation necessary to ensure consistency of application. The Commission's failure thus far to critically examine these methodologies has permitted an upward bias in their application, which is likely to create at least several more years of uncertainty concerning the ultimate outcome of an FPA Section 206 proceeding. The Commission should recognize that, even if it discards the counterfactual Expected Earnings analysis (as it should), it faces additional years of litigation as asset owners attempt to exploit, and consumers attempt to constrain the effects of, the need for "adjustments" in how the Commission implements the CAPM and Risk Premium analyses that it has previously found only

sufficient to "corroborate" its determination to place DCF results above the midpoint in setting ROEs.[49]

In addition, if the *Coakley* Briefing Order proposal were adopted without substantial modification, neither side in a contested case would have much motivation to settle at the Commission level due to the decided lean of the *Coakley* Briefing Order proposal toward above-market ROEs. Asset owners would likely rely on the Commission's demonstrated pre-disposition toward their desire for above-market ROEs, while consumers would be required to resort to appellate proceedings for vindication of their interests. The additional complexity and significant litigation likely associated with the Proposed Methodology is likely to severely restrict the ability of interested parties and investors to reliably evaluate the strength of any ROE related filings.

Commission Question:

A.3. Currently, public utilities in different Independent System Operators (ISOs) or RTOs may receive different ROEs, despite all using national proxy groups, due primarily to differences in when FPA section 205 or 206 proceedings were initiated. Are such variations justified, and, if not, should the Commission consider applying the same ROE to all utilities in RTOs/ISOs based on the most recent proceeding?

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[49] *Coakley* Briefing Order, 165 FERC ¶ 61,030 at P 39.

EMCOS Response:

The "differences in when FPA section 205 or 206 proceedings were initiated" are more than differences in litigation dates. The differences in just and reasonable ROEs growing out of different proceedings should reflect the different capital market conditions prevailing at the time that the relevant ROE was set, different assessments of the value and prospects of specific utilities by the capital markets, perceptions of risk both market-wide and specific to the utility, and a host of other considerations that affect the market cost of equity capital. Those differences in the perception by capital markets of a particular utility or utilities at a particular time amply justify different ROEs. If a given ROE proves insufficient to meet the capital needs of a specific asset owner, "[t]he [Federal Power] Act contains machinery for obtaining rate adjustments."[50] If the ROE exceeds the capital needs of the asset owner, the owner will take no action and that situation will compel the customers to use the slower machinery of FPA Section 206 to obtain relief. In both situations, either the utility or its customers are enabled by the FPA to respond appropriately to the price signals provided by the capital markets. In neither case is there any justification for automatic adjustments. Moreover, automatic adjustments in return on equity have long been appropriately rejected by the Commission.[51]

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50 *FPC v. Hope Natural Gas Co.*, 320 U.S. 591, 615 (1944).

51 *New England Pwr. Co.*, 31 FERC ¶ 61,378 at 61,841 (1985).

Commission Question:

A.4. Should the ROE reflect the cost of capital at the time of the investment or be subject to adjustment to reflect the contemporary ROE required by investors?

A.4.a. Should the Commission consider a "vintage approach," with ROE fixed for the life of the asset at the time that each asset was completed?

A.4.b. Would such a "vintage approach" need to be coupled with an annual national default ROE for investments made in that year, so as to minimize the need for numerous annual litigated ROE proceedings for each public utility that made an investment during that year? What procedure should be used to determine such a default ROE?

EMCOS Response:

The "vintage" approach contemplated by the question is impermissible under *Bluefield* and *Hope*, both of which contemplate that returns on common equity will necessarily vary with the prevailing market cost of equity capital,[52] and that the returns earned by a given firm "should be commensurate with returns on investments in other enterprises having corresponding risks."[53] Assigning a "permanent" return on equity to specific assets based on the date that they entered service would also

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[52] *Bluefield Water Works & Improvement Co. v. Pub. Svc. Comm'n of W. Va.*, 262 U.S. 679, 693 (1923) ("A rate of return may be reasonable at one time and become too high or too low by changes affecting opportunities for investment, the money market and business conditions generally"); *FPC v. Hope Natural Gas Co.*, 320 U.S. 591, 615 (1944) ("This is not an order for all time. The Act contains machinery for seeking rate adjustments").

[53] *FPC v. Hope Natural Gas Co.*, *supra*, 320 U.S. at 603.

result in vastly greater complexity for setting rates, as each asset could have its own ROE. Moreover, as the concept of commensurate risk requires, the cost of equity capital is not linked to individual utility assets; but is instead a function of the capital markets' perception of the entire public utility, its operations and its prospects.

B. EMCOS Take No Position Concerning Pipeline Returns on Equity

As a group, EMCOS present no position to the Commission concerning the Commission's questions on pipeline returns on equity.

C. The DCF Model Remains Robust and Reliable

Commission Questions:

C.1. The DCF model assumes stock prices are equal to the present value of projected future cash flows. Is there evidence of situations when these assumptions are inaccurate?

C.2. Have current and projected proxy company earnings over the last 10 to 20 years increased in a manner that would justify any increases in their stock prices over the same period, consistent with DCF model assumptions?

C.3. How does the DCF methodology perform over a wide range of interest rate conditions?

C.3.a. What specific assumptions of the DCF model, if any, do not work well in low or high interest rate environments?

C.3.b. Is there evidence that the volatility of price-to-earnings ratios over the last 10 to 20 years, assumed to be constant in the DCF methodology, has been driven

by the wide swings in interest rates over this period? If so, would the constant P/E assumption impact the award of reasonable ROEs?

EMCOS Responses:

"The DCF method 'has become the most popular technique of estimating the cost of equity, and it is generally accepted by most commissions. Virtually all cost of capital witnesses use this method, and most of them consider it their primary technique.'"[54] Prior to the diffidence it developed in Opinion No. 531, the Commission had relied on the DCF analysis consistently over periods of economic stress, including the extreme interest rates of the late 1970s and early 1980s,[55] the "Black Monday" stock market crash of October 1987, the market turmoil following the September 2001 terrorist attacks and a wide range of other capital market conditions. Indeed, any of

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[54] *Ill. Bell Tel. Co. v. FCC*, 988 F.2d 1254, 1259 n. 6 (D.C. Cir. 1993), *quoting* J.C. Bonbright, A.L. Danielsen and D.R. Kamerschen, *Principles of Public Utility Rates* (Public Utility Reports, Inc. 2d ed., 1988), at 317-18.

[55] *See, e.g., Minnesota Pwr. & Lt. Co.*, Opinion No. 12, 3 FERC ¶ 61,045, at 61,132-61,133(1978) ("We are interested in forward looking analyses of the market's required rates of return. The Commission seeks to have before it estimates of the opportunity cost of equity capital in capital markets to use in making rate of return determinations. Market oriented techniques, including the DCF approach, are useful in this regard"); *Generic Determination of Rate of Return on Common Equity for Public Utilities*, Order No. 461, FERC Stats. & Regs. ¶ 30,722, at 30,499 & n. 189 (1987) (finding "compelling economic justification for relying on the market cost of capital as the standard for rate of return decisions"), *citing* Kolbe, Reed, Jr. and Hall, *The Cost of Capital: Estimating the Rate of Return for Public Utilities* (1984) at 21; *Generic Determination of Rate of Return on Common Equity for Public Utilities*, Order No. 420, FERC Stats. & Regs. ¶ 30,644 at 31,336 (1985) ("In the exercise of this statutory responsibility [to determine just and reasonable rates], the Commission seeks to set rates of return on common equity that are fair to both ratepayers and stockholders. The current market cost of common equity to the regulated utility is viewed as the proper cost-based standard for this purpose") and 31,338 ("the Commission places primary reliance on the discounted cash flow (DCF) approach to estimating the market required rate of return on common equity").

the aforementioned market stress events would be far more appropriately characterized as "anomalous" than low interest rates following the economy's emergence from the Great Recession. Yet, none induced any outcry for adjustments in the application of the DCF analysis or suggestions that it had somehow become uniquely disabled as a tool for estimating the market cost of equity capital.

The characterization in Question C.1 – that the DCF "assumes stock prices are equal to the present value of projected future cash flows" – is incomplete and therefore incorrect. What the DCF actually assumes is that, at a given time, the price of an equity security is equal to the present value of the stream of dividends anticipated at that time to be the security's cash flow.[56] By eliminating the temporal dimension of the valuation exercise actually involved in the DCF, the characterization in Question C.1. creates the mistaken impression – also reflected in the *Coakley* Briefing Order (at PP 45-46) – that the DCF analysis somehow depends on relatively constant price/earnings (P/E) ratios over time.[57] This is incorrect, as is the stated premise of Question C.1. Variations in P/E ratios over time provide no useful information concerning the accuracy of the DCF in estimating the market cost of equity capital.[58]

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[56] *See*, *e.g., New England Pwr. Co.*, 22 FERC ¶ 61,123 at 61,187-61,188 (1983) ("the price that investors will pay for a common stock at a given time reflects, among other things, investors' decisions based on the dividend they would receive as shareholders at that time").

[57] The Commission offered Figure 3 of the *Coakley* Briefing Order for the purpose of illustrating the mistaken contention advanced in Commission Question C.1 and Paragraphs 45 and 46 of the *Coakley* Briefing Order. However, the Commission subsequently acknowledged that it "does not have access to the data or analyses that were used to produce that chart." *Coakley, et al. v. Bangor Hydro-Elec. Co., et al.*, 166 FERC ¶ 61,013 at P 9 (2019).

There is nothing about robust P/E ratios that suggests that transmission owners need higher returns in order to attract capital. Indeed, the fact that utility stock prices appear to have outpaced earnings growth is likely a function of a number of other factors – included among which would have to be broader economic conditions, and a highly favorable regulatory environment at the federal level – that go unmentioned in the NOI or the *Coakley* Briefing Order. High equity prices reflect high demand for utility shares, which in turn contributes to ample capitalization and – all other things being equal – reduces the level of return required to attract investment. There is nothing more "anomalous" at work in the operation of these factors than the interaction of supply and demand.

As there is no assumption of "constant" P/E ratios underlying the DCF analysis, there is no reason to consider whether alleged "volatility of price-to-earnings ratios over the last 10 to 20 years . . . has been driven by the wide swings in interest rates over this period."

D. Proxy Groups

Commission Question:

D.1. Should proxy groups for electric utilities, as well as natural gas and oil pipelines, consist only of companies with corresponding regulated businesses?

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[58] *Pub. Svc. Co. of Indiana*, Opinion No. 44, 7 FERC ¶ 61,319 at 61,710 n. 75 (1979) ("The essential problem with the earnings-price ratio as a measure of investors' return requirements is that the numerator and denominator of the ratio are not in synchronization with one another. In other words, the 'price' in the denominator reflects investors' future expectations of growth in earnings and dividends, while the 'earnings' in the numerator usually represents recently reported historical earnings. This being so, such a ratio will not generally reflect the return expectations that investors actually had in mind when they established the current price").

EMCOS Response:

Yes. Limiting the proxy group to corresponding regulated businesses is the only objective way of which EMCOS is aware to ensure the proxy group consists of risk comparable companies. Under *Hope* and *Bluefield* a return must be commensurate with the returns earned by comparable risk enterprises to be just and reasonable.[59] Comparable risk is a pivotal determination because a utility "has no constitutional right to profits such as are realized or anticipated in highly profitable or speculative ventures."[60] In recognition of this fact, the Commission has correctly held that the primary concern in selecting a proxy group is identifying "companies with comparable risks to those facing the applicant."[61] Permitting proxy groups to include companies from an industry different from the target utility would obscure the data necessary to identify a just and reasonable ROE by introducing results that may reflect fundamentally different business or regulatory structures than those

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59 *Bluefield Waterworks and Improvement Co. v. Public Serv. Comm'n of West Virginia*, 262 U.S. 679 (1923) ("*Bluefield*") ("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."); *Fed. Power Comm'n v. Hope Natural Gas Co.*, 320 U.S. 591 (1944) ("*Hope*") (A just and reasonable return is "commensurate with returns on investments in other enterprises having corresponding risks" and "should be sufficient to assure confidence in the financial integrity of the enterprise, so as to maintain [a utility's] credit and to attract capital.").

60 *Bluefield*, 262 U.S. at 692-693.

61 *Atlantic Path 15, LLC*, 133 FERC ¶ 61,153 at P 13 (2010). *See also Petal Gas Storage, LLC v. FERC*, 496 F.3d 695, 699-700 (D.C. Cir. 2007) ("That proxy group arrangements must be risk-appropriate is the common theme… The principle is well-established.")

faced by regulated utilities. Expanding proxy groups beyond regulated utilities would also prove administratively burdensome as parties inundate the Commission with unending iterations of proxy groups composed of different members from different industries in an attempt to support their desired outcome. Such an outcome would further erode certainty in the Commission's ROE methodology, encourage litigation, and reduce stability in ROE results.

Commission Question:

D.1.a. For companies with a combination of regulated and unregulated businesses, should a company be required to derive a certain percentage of its revenues from the applicable regulated business in order for that company to be included in the proxy group that is used to determine an ROE for a company in that regulated business?

EMCOS Response:

The limitation suggested in question D.1.a would be useful to ensure the proxy group is of comparable risk. However, EMCOS does not believe such a restriction is necessary in the context of public utility ROEs. This is because the *Value Line Investors' Survey* listing of "electric utilities," which is the starting point for every contemporary public utility proxy group, contains a sufficiently large sample of prospective proxy group members to ensure the availability of an appropriately sized proxy group.

Commission Question:

D.1.b. Are the corresponding proxy groups sufficiently large given the continued consolidation in the industries?

EMCOS Response:

With regards to electric utilities, the Commission's current proxy group screening requirements result in sufficiently large proxy groups in EMCOS' experience. The Commission's starting point of considering all companies designated by *Value Line* as electric utilities remains sounds and is a necessary requirement to ensure risk comparability. Similarly, the Commission's requirement that a company have a credit rating from either Moody's or S&P is a public, transparent and well-respected method of evaluating the riskiness of a company. The Commission should continue this requirement. On the electric side, the Commission's current practices for screening proxy group companies continue to properly balance the need for risk comparable proxy groups with the need for a sufficiently robust sample size to identify a just and reasonable ROE.

Commission Questions:

D.2. Should risk be considered both in the proxy group selection and in placement within the zone of reasonableness?

D.2.a. Should the Commission's approach to proxy group selection change depending on which financial models it considers when determining the just and reasonable ROE and, if so, how?

EMCOS Responses:

The Commission's proxy group criteria are specifically designed to produce proxy groups facing risks comparable to those of the target utility. As the Commission has noted:

> The purpose of the proxy group is to 'provide market-determined stock and dividend figures from public companies comparable to a target company for which those figures are unavailable. …It is therefore crucial that the firms in in the proxy group be comparable to the regulated firm whose rate is being determined. In other words, as the court emphasized in *Petal*, the proxy group must be risk appropriate.[62]

The determination of whether or not a company faces comparable risk to the target utility is therefore methodology agnostic and should be the same regardless of which methodology the Commission applies. Additionally, while the Commission's methodology strives to identify a group of risk comparable companies, there may remain unique factual circumstances that warrant placing the target utility's ROE either above or below the point of central tendency in the resulting zone of reasonableness. The Commission should retain its flexibility to address those circumstances on a case-by-case basis when record evidence supports such a deviation.

Commission Questions:

D.3. Should the Commission consider non-energy companies when selecting proxy groups?

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[62] Proxy Group Policy Statement, 123 FERC ¶61,048, at P 48 (2008), quoting *Petal Gas Storage, LLC v. FERC*, 496 F.3d 695, 699 (D.C. Cir. 2007).

D.3.a. What non-energy industries or securities have comparable risk to public utilities and natural gas oil pipelines, if any?

D.3.b. Do certain non-energy industries or securities feature fewer outliers?

EMCOS Responses:

No, the Commission should not consider non-energy companies when selecting a proxy group. As discussed in response to question D.1 above, *Hope* and *Bluefield* require the Commission identify a return commensurate with those earned by those companies facing comparable risk to the target utility. Non-energy companies face undeniably different business and regulatory risks than those faced by public utilities and natural gas oil pipelines, making them inappropriate for inclusion. Including non-energy companies in a proxy group would therefore skew the resulting ROE to reflect the risks facing those industries and not the risks facing the target utility.

Additionally, relaxing the proxy group criteria to include non-energy companies would be akin to opening Pandora's box. Which industries would be permitted, and what screening criteria or methodological manipulations would be required to adjust for the differences in regulatory requirements between industries? Answering those questions alone would require the dedication of a significant amount of the Commission's resources and invite litigation likely to stretch on for years. Further, the Commission will likely find itself inundated as parties seek to find the proxy group composition most beneficial to their position. As a result, expanding the proxy group beyond energy industries would not only violate the tenants of *Hope* and *Bluefield*, but would also be an administrative nightmare.

Commission Questions:

D.4. What, if any, are the appropriate high-and low-end outlier tests?

D.4.a The Commission currently excludes from the proxy group companies whose ROE fails to exceed the average 10-year bond yield by approximately 100 basis points. Should the low-end outlier test continue to be based on a fixed value relative to the costs of debt or (a) should it be based on its value relative to the median (i.e., less than 50 percent of the median); or (b) still reflect the cost of debt by vary based on the interest rates?

D.4.b. How, if at all, should the Commission's approach to outliers vary among different financial models?

EMCOS Responses:

The Commission should adopt objective, easily applied and statistically sound outlier tests. Outlier tests should be uniformly applied regardless of the financial model at issue. Screening results for outliers is necessary to ensure that the ROE the Commission ultimately identifies is truly reflective of the target utility's risk profile and is not the result of an aberrant or unsustainable result that is not reflective of current capital market conditions.[63] This is especially true should the Commission continue its reliance on the midpoint for identifying the just and reasonable ROE for a group of utilities, because the midpoint is determined exclusively by the high and low points of a range.

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63 *See i.e. Coakley* Briefing Order at P 53.

EMCOS have advocated for the use of the Grubbs Test, a well-known and widely used statistical test to screen for high-end outliers.[64] The Grubbs Test compares the highest or lowest value in a sample, compares it to the average of the sample, and measures the largest absolute deviation from the same mean in units of the sample's standard deviation.[65] Here, the relevant sample is the proxy group and the Grubbs Test would be applied iteratively to proxy group members at the top of the zone of reasonableness until the analysis indicates the member is not an outlier.[66]

The Grubbs Test's reliance on standard deviations allows it to take into account how tightly clustered the members of the proxy group are to the average. As a result, if a proxy group is composed of widely dispersed members, it will be more difficult to identify any single member as an outlier. This stands in contrast to the *Coakley* Briefing Order's proposal which does not account for the proxy group's distribution. The 150% of median screen is an arbitrary threshold that does not appear to be based on any informative relationship between the proxy group and the outliers it would exclude. As a result, the Grubbs Test provides a statistically sound method for evaluating and eliminating outliers and is better suited to identifying a just and reasonable ROE.

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64 *See i.e.* Initial Brief on Paper Hearing of Eastern Massachusetts Consumer-Owned Systems, filed in Docket No. EL16-64 at 48-50 (Jan. 11, 2019).

65 Exhibit EMC-0400 at P 88, Docket No. EL16-64.

66 Exhibit EMC-0400 at P 88-91, Docket No. EL16-64.

EMCOS believes the Commission's existing low-end threshold test remains sound and should continue to be applied. The low-end threshold test is easily understood, easily applied, and reflects current market conditions because it is based on a case-by-case calculation that reflects the currently identified cost of debt. Finally, as discussed in response to question D.10, many of the concerns related to outliers would be mitigated by use of the median instead of the midpoint. Use of the median would provide more predictability and stability in ROE determinations, which would benefit consumers, utilities, and investors alike.

Commission Questions:

D.5. How, if at all, does the Commission's use of credit ratings in ROE determination incentivize public utilities to behave in certain way, such as issuing more debt, and does this affect public utilities' credit ratings?

D.6. What would be the impact of the Commission modifying the credit rating screen to include all investment-grade utilities in the proxy group?

D.7. To what extent do credit ratings correspond to the ROE required by investors?

EMCOS Responses:

The credit ratings screen is one of the ways in which the Commission seeks to identify a proxy group of comparable risk utilities. The Commission has recognized that "[e]stablishing risk comparability is a difficult task" made all the "more formidable because comparability in risk should be evaluated from the standpoint of

investors' risk perception."[67] The need to identify investors' risk perception "puts a premium on the use of published investor services that are widely relied on by investors to make their decisions."[68] Credit ratings are a precise fit for this criteria: they are transparent, widely available to the public, and based on published reports "rather than being based on the often self-serving judgment of litigants."[69]

Further, restricting a proxy group to companies with similar credit ratings to the target utility helps ensure risk comparability because "[c]ommon sense dictates that a company with a high credit rating will be perceived as a lower risk by equity investors than a company with a low credit rating" and vice versa.[70] Investors will require a higher ROE for a company they view as presenting more risks and credit ratings are the most reliable metric to reflect this calculus in a proxy group screen. Modifying this screening criteria to include all investment-grade public utilities in a proxy group would therefore lead to results that are less reflective of the risks facing the target utility in violation of *Hope* and *Bluefield*. EMCOS is not aware of any evidence to suggest that the Commission's ROE methodology incentivizes utilities to act in ways that would alter their credit rating.

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67 *El Paso Natural Gas Company*, 145 FERC ¶61,040 at P 628 (2013).

68 *Id.*

69 *Id.*

70 *Id.* at P 631.

Commission Questions:

D.8. The Commission excludes from the proxy group companies with merger activity during the six-month study period that is significant enough to distort study inputs. Should the Commission continue our existing merger screen?

D.8.a. If so, should the Commission revise its standards for what conduct constitutes merger and acquisition activity?

EMCOS Responses:

The Commission's merger and acquisition screen recognizes that "once a company is the subject of an acquisition, the growth rate is based on whatever is expected to happen between that time and when the buyout is complete, which is inconsistent with the Commission's method which seeks to compute a growth rate beyond five years."[71] EMCOS strongly agrees with the need to eliminate utilities whose model inputs have been skewed by merger and acquisition activity from a proxy group. However, the Commission has yet to provide empirical guidance on how to evaluate whether activity is significant enough to require exclusion. As a result, this screen is often the source of protracted disputes between parties.

EMCOS believes the Commission should exclude all utilities involved in merger or acquisition activity unless the proponent of including that utility can show the activity does not distort model inputs. To prove the absence of such distortions, the Commission should require the use of an event study to measure the impact of

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[71] *Kern River Gas Transmission Co.*, 126 FERC ¶61,034, P 79 (2009), quoting *Enbridge Pipelines*, 100 FERC ¶61,260 at P 237 (2002).

the activity on the company's value. EMCOS has fully briefed and supported the application of event studies to evaluate the impact of merger activity in their filings in Dockets No. EL11-66,[72] EL13-33, EL14-86[73] and EL16-64.[74]

Commission Question:

D.9. What circumstances or factors, if any, warrant an adjustment from the midpoint/median to other points within the zone of reasonableness (e.g. lower or upper midpoint/median)?

EMCOS Response:

The Commission's current proxy group screening criteria are designed to produce proxy groups composed of companies facing comparable risk to the target utility. Under these circumstances, placing the ROE at the median[75] remains the most statistically robust and supported methodology for identifying a just and reasonable result. However, the Commission should retain the flexibility to place the ROE elsewhere in the range in the unique circumstances where the record illustrates that the target utility faces materially higher or lower risks than the proxy group as

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72 Docket No. EL11-66, EMCOS Initial Brief on Paper Hearing at 50-52; Exhibit EMC-0200 at P 64-74 (Jan. 11, 2019).

73 Dockets No. EL13-33 and EL14-86, EMCOS Initial Brief on Paper Hearing at 59-61; Exhibit EMC-0300 at P 67-82 (Jan. 11, 2019).

74 Docket No. EL16-64, EMCOS Initial Brief on Paper Hearing at 50-51; Exhibit EMC-0400 at P 67 -78 (Jan. 11, 2019).

75 EMCOS recognizes that Commission precedent is to use the midpoint to identify the returns for a group of utilities. As discussed in response to question D.10, the median is a more statistically robust measure of central tenancy whose use would bring stability to the Commission's ROE methodology. Therefore, EMCOS refers to only the median here.

a whole. One such example is if the target utility has a capital structure that is materially different from those of the proxy group companies.[76]

Any deviation from the median must be supported by the record and should require a quantification of how the reduction or increase in risk warrants an adjustment in the placement within the zone. To this end, the Commission should not restrict placement to the median of the lower half, median, and median of the upper half of the zone. Such a limitation would interfere with "the Commission's statutorily prescribed role in resolving the 'intensely practical difficulties' inherent in 'reduc[ing] the abstract concept of reasonableness to concrete dollars and cents,'" as well as nullify the Commission's mandate to ensure that rates are neither less than compensatory to the seller nor excessive to the consumer.[77]

Commission Questions:

D.10. The Commission currently uses midpoints to determine the central tendency of the zone of reasonableness when determining RTO-wide ROEs. Should the Commission adopt a policy of using medians for this purpose?

D.10.a. Would the use of multiple ROE methodologies, as proposed in the *Coakley* Briefing Order, undercut the Commission's current rationale for using the midpoint in the RTO-wide base ROE?

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76 *See* Docket No. EL16-64 Initial Brief of Complainants at 47-49 (Jan. 19, 2018); Exhibit EMC-0012 at 17-25; EMC-0026 at 4; EMC-0051 at 39-45.

77 *Bangor Hydro-Electric Co.*, 122 FERC ¶61,038 at P 14 (2008).

D.10.b. Should the size of the proxy group be considered in this decision?

EMCOS Responses:

The Commission should amend its policy to use the median to determine the just and reasonable ROE for determining RTO-wide ROEs. The Commission must rely on credibly, accurate, and robust statistically measures to ensure the ROE it selects is just and reasonable. The median is more appropriate for this purpose because it is not sensitive to extreme values and is therefore a more statistically robust measure of central tendency. Additionally, using the median would eliminate much of the volatility the industry has seen over the course of the NETO and MISO series of complaint cases. As a result, using the median would provide a measure of stability that benefits both consumers and utilities and will therefore aid the Commission in its obligation to fairly balance these two often divergent interests. Finally, as explain in Section II.D. above, the reasons that previously supported the Commission's use of the midpoint have been overtaken by changes to the methodology and are no longer valid.

Commission Question:

D.11. Can the Commission continue to construct proxy groups of sufficient size for natural gas and oil pipeline companies using the DCF methodology, or in general for the alternative methodologies, particularly considering the increased amounts of merger and acquisition activity involving master limited partnerships (MLPs) and the multiple recent conversions of MLPs to C-corporations?

EMCOS Response:

EMCOS do not take a position on this question.

E. Selection and Uses of Financial Models; Misuse of State ROEs

The Commission's questions in this section of its NOI address two discrete topics: (1) choices and uses of financial models, and (2) what role, if any, is appropriate for consideration of State returns on common equity in identifying just and reasonable ROEs under the Federal Power Act. EMCOS group our responses to the Commission's questions under these two broad but distinct topics below.

1. Selection and Uses of Financial Models

The appropriate measure of the just and reasonable ROE is the market cost of equity capital for the utility or utility whose rates are under review.[78] Ascertaining the market cost of equity capital "is a standard of finance resting on stubborn facts,"[79] but the market cost of equity capital is inherently unobservable and must therefore be estimated. Any cogent analysis of the market cost of equity capital rests on the efficient market hypothesis ("EMH"), "[t]he cornerstone of modern investment

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78 *Generic Determination of Rate of Return on Common Equity for Public Utilities*, Order No. 461, FERC Stats. & Regs. ¶ 30,722, at 30,499 & n. 189 (1987) (finding "compelling economic justification for relying on the market cost of capital as the standard for rate of return decisions"), *citing* Kolbe, Reed, Jr. and Hall, *The Cost of Capital: Estimating the Rate of Return for Public Utilities* (1984) at 21; *Generic Determination of Rate of Return on Common Equity for Public Utilities*, Order No. 420, FERC Stats. & Regs. ¶ 30,644 at 31,336 (1985) ("In the exercise of this statutory responsibility [to determine just and reasonable rates], the Commission seeks to set rates of return on common equity that are fair to both ratepayers and stockholders. The current market cost of common equity to the regulated utility is viewed as the proper cost-based standard for this purpose") and 31,338 ("the Commission places primary reliance on the discounted cash flow (DCF) approach to estimating the market required rate of return on common equity").

79 *Colorado Interstate Gas Co. v. FPC*, 324 U.S. 581, 605 (1945).

theory."[80] "The EMH states that investors *immediately* incorporate all publicly available information, including information about expected future market conditions, into asset prices today. Thus, under the EMH, the price of a stock today is based on investors' collective expectations of the present value of the stock's future cash flows."[81] As a result, only a return that is based on the market cost of equity capital satisfies the requirements of *Hope* and *Bluefield*, and the Commission's "mandate to ensure that rates are neither less than compensatory to the seller nor excessive to the consumer."[82] Finally, it is useful to keep in mind the observation that "[a]n agency blend of ratemaking methods . . . is arbitrary and capricious if the expected results are so."[83]

Commission Questions:

E.1. What models do investors use to evaluate utility equities?

E.2. What role do current capital market conditions play in the choice of model used by investors to evaluate utility equities?

E.2.a. If capital market conditions factor into the choice of model, how do investors determine and evaluate those conditions?

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80 *Tennessee Gas Pipeline Co. v. FERC*, 926 F.2d 1206, 1210 (D.C. Cir. 1991). *See also Basic, Inc. v. Levinson*, 485 U.S. 224, 246 (1988) (". . . empirical studies have tended to confirm . . . [the] premise that the market price of shares traded on well-developed markets reflects all publicly available information . . . .").

81 *See Generic Determination of Rate of Return on Common Equity for Public Utilities*, Order No. 461, FERC Stats. & Regs. ¶ 30,722, at 30,499 (1987).

82 *Bangor Hydro-Electric Co., et al.*, 122 FERC ¶ 61,038 at P 14 (2008).

83 *Ill. Bell Tel. Co. v. FCC*, 988 F.2d 1254, 1260 (D.C. Cir. 1993).

E.3. Are any models thought to be superior or inferior to others? If so, why?

E.4. How are alternative models redundant or complementary with each other and/or the DCF model?

E.5. To what extent do alternative models avoid any deficiencies of the DCF model and/or operate better in diverse capital market conditions?

E.6. To the extent that investors use multiple models, should the Commission combine them in its analysis or use the "best" one that would apply in all market conditions?

E.7. If the Commission were to consider multiple models, how should it weigh them?

E.8. To what extent is it reasonable for the Commission to use a simplified version of a model that does not reflect all the variables that investors consider?

E.8.a. Is the use of a simplified model justified for ease of administration and predictability of result?

E.11. To what extent, if any, should the Commission exercise judgment in using financial models to set ROEs under various capital market conditions?

EMCOS Responses:

EMCOS believe that investors use models that implement and reflect the Efficient Market Hypothesis. These models primarily include the DCF and CAPM in various versions. There is little, if any, credible evidence that investors rely on the Expected Earnings methodology that drives the illustrative result in the *Coakley* Briefing Order above the levels indicated by the market-based methodologies (*i.e.*, the

DCF, CAPM and (if properly conducted) the Risk Premium analysis). By 1985, the Expected Earnings analysis had been "thoroughly discredited" in the academic literature.[84] Indeed, the evidence cited by the Commission in Opinion No. 531 as support for the view that investors rely on Expected Earnings analysis does not in fact support the characterization given to it in Opinion No. 531.[85] There is thus no credible basis for the Commission to rely on the Expected Earnings analysis in identifying a just and reasonable ROE, regardless of whatever attraction may lie in the boost that it can impart to ROE results.

All of the market-based analyses of cost-of-equity – the DCF, the CAPM and the Risk Premium analyses – perform reliably in a wide range of prevailing interest rates and other capital market conditions. Interest rates are either direct or indirect inputs in each of these analyses. Their proven reliability over a wide range of economic circumstances is the primary consideration that leads investors to rely on them.

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84 E. Brigham, D. Shome, and S. Vinson, "The Risk Premium Approach to Measuring a Utility's Cost of Equity," *Financial Management* (Spring 1985) at 33 ("Previously, the standard approach in cost of equity studies was the 'comparable earnings method,' which involved selecting a sample of unregulated companies whose investment risk was judged to be comparable to that of the utility in question, calculating the average return on book equity (ROE) of these sample companies, and setting the utility's service rates at a level that would permit the utility to achieve the same ROE as comparable companies. This procedure has now been thoroughly discredited . . . , and it has been replaced by three market-oriented (as opposed to accounting-oriented) approaches: (i) the DCF method, (ii) the bond-yield-plus-risk-premium method, and (iii) the CAPM, which is a specific version of the generalized bond-yield-plus-risk-premium approach"). *And see* articles cited at Exhibit EMC-001.

85 *See* Affidavit of Jonathan A. Lesser, Ph.D. (Exhibit EMC-0300) in Docket No. ER18-1639-000, filed April 19, 2019, at 68:5-71:2 (discussing *Coakley v. Bangor Hydro-Elec. Co.*, Opinion No. 531, 147 FERC ¶ 61,234 at P 147 (2014) and Opinion No. 531-B, 150 FERC ¶ 61,165 at P 129 & n. 277 (2015)).

Correctly implemented, the results of each of the market-based analyses will tend to corroborate each other. This is fundamentally logical, as each of the market-based cost-of-equity estimation methods seeks to evaluate the same thing – the market cost of equity capital. The qualification "correctly implemented" is critically important here, however. As EMCOS have explained at some length in the Section II to these Comments, the reasons for the Commission's discomfort with the acuity of the DCF in estimating the market cost of equity capital in post-Great Recession capital market conditions stem from the result of a credulous acceptance of "gamed" results from non-DCF methodologies. For the CAPM, the analysis depends on an expected market return estimated using assumptions that fail to meet "threshold tests of economic logic"[86] while the proposed Risk Premium application provides no useful information at all concerning current-day risk premia. Had the Commission avoided the diversions and distractions created by these (and other) methodological misapplications, adoption of the Commission's own DCF midpoint result in Opinion No. 531 would likely have avoided a great deal of unproductive effort.

Against this background, it is important that the Commission stick to market-based analyses of the market cost of equity capital and ensure that market-based non-DCF analyses are performed with the same level of discipline that the Commission has developed in its 35 years of reliance on the DCF analysis. There is no need to "combine" the market-based cost-of-equity estimation models because, as

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[86] *ISO New England, Inc.*, 109 FERC ¶ 61,147 at P 205 (2004).

discussed above, their results will be mutually corroborative if they are performed and implemented on a methodologically sound basis.

Finally, the Commission can and does rely on simplified versions of a model for estimating the market cost of equity capital. The Commission's weighted average growth rate construct, used in DCF analyses for gas pipelines since 1979 and for all DCF analyses since Opinion No. 531 issued five years ago, is one example of constructive simplification of an economic model. The rationale for the simplification is quoted at length in Part H. of these comments, but the Commission's observation concerning intermediate stage growth rates in a multi-stage DCF analysis depending on predictions and "such predictions of the future are not well-suited to litigation where the witness for each party is likely to choose from among reasonable alternatives, those data and methodologies that most favor his or her client's financial interest, and there are no objective criteria for the Commission to make distinctions between what will be the equally well-reasoned and well-supported judgments of the equally well-credentialed experts"[87] bears repeating here. Economic models that use straightforward, transparent, objective criteria that are relatively simple for the Commission and litigants before it to apply are vastly preferable to complication in the name of economic orthodoxy that ultimately produces precision without accuracy.

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87 *Williston Basin Interstate Pipeline Co.*, 79 FERC ¶ 61,311 at 62,390 (1997), *remanded on other grounds sub nom. Williston Basin Interstate Pipeline Co. v. FERC*, 165 F.3d 54 (D.C. Cir. 1999).

2. State ROEs

Commission Questions:

E.9. How, if at all, should the Commission consider state ROEs?

E.9.a. How and why do state ROEs vary by state?

E.9.b. How are certain state ROEs more or less comparable to Commission ROEs?

E.10 If the Commission considers state ROEs, how should it compare FERC jurisdictional transmission ROEs with state ROEs that apply to utilities that are (a) distribution and transmission companies; or (b) distribution, generation, and transmission companies?

EMCOS Responses:

The Commission's reliance on State-awarded returns on common equity to validate its distaste for its straightforward DCF midpoint result in Opinion No. 531 marks yet another instance in which the Commission stepped off a well-marked path in its customary cost-of-equity analyses. Prior to Opinion No. 531, the Commission had a well-established practice of reacting with asperity to suggestions that its ROE determinations ought to be informed by results reached in State decisions.[88] The

[88] *See, e.g.*, *Virginia Elec. Pwr. Co.*, 123 FERC ¶ 61,098 at P 68 (2008) ("Finally, the fact the VSCC may have found that the appropriate ROE for the retail services of utilities subject to its jurisdiction is about 10 percent is not relevant to our determination of the appropriate ROE to include in VEPCO's rates for the interstate services subject to our jurisdiction. The Commission has conducted an ROE analysis utilizing comparable companies consistent with our precedent which supports the rate of return we are accepting"); *New England Pwr. Co.*, 31 FERC ¶ 61,378 at 61,841 (1985) ("This adjustment would not only subordinate this Commission's regulation to that of state commissions, but it is also an implicit admission by NEPCO that its risk premium formula determination may not produce a proper return on equity").

Commission's pre-Opinion No. 531 treatment of State ROE determinations was correct, and the Commission should return to it.

The fundamental problem with reliance on State ROEs is that they reflect State – not Commission – regulatory policies. A given State may have perfectly fine regulatory policies that it implements through, *inter alia*, its regulatory commission's ROE determinations.[89] Those State policies may or may not be compatible with or relevant to this Commission's policies. In addition, and in any case, those State policies are not likely to be transparent to parties litigating ROE issues before this Commission, or to the Commission itself.

Alabama provides a useful illustration. For many years, the Alabama Public Service Commission has implemented a rate stabilization and equalization ("RSE") plan for Alabama Power Company, a subsidiary of Southern Company. The RSE "represents a ratemaking formula designed to provide periodic revenue adjustments (increases or decreases) calculated to allow the Company to earn a 15% return on its common equity capital."[90] Under the RSE, which remains in effect to this day, ROE is held constant within a stipulated range, while rates are adjusted with changes to Alabama Power's capital structure. The current RSE ROE range is 13.0-14.5 percent.[91]

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89 State-allowed returns on common equity are typically what is cited in *Value Line Investors' Survey* reports on public utilities, in footnote e, as "allowed ROE." This is another reason not to rely on *Value Line* reports as indicators of just-and-reasonable ROEs.

90 *Alabama Metallurgical Corp. v. Alabama Pub. Serv. Comm'n*, 441 So. 2d 565 (1983).

There are comparable examples in many other jurisdictions. The Virginia State Corporation Commission, for example, maintains a practice of awarding plant-specific return-based incentives for particular power plants. The Iowa State Utilities Board pursues a similar practice. Unless one were aware of, and had data sufficient to adjust for, these particular State practices, it would be impossible to develop an apples-to-apples comparison of State-allowed ROEs to considerations relevant to the development of an ROE for service subject to this Commission's jurisdiction.

Apart from the difficulties in developing useful correlations between State-allowed and Commission-allowed ROEs, the nature of the utility business regulated at the State and federal levels is frequently quite different. Many utilities remain vertically integrated at the State level, meaning that their ownership and operation of generating facilities imposes costs and risks that Commission-jurisdictional transmission owners do not confront. Even where utilities are not vertically-integrated, differences between State policies implemented through allowed returns for distribution-only utilities and Commission policy underlying allowed returns for transmission owners subject to its jurisdiction are likely to be sufficiently different to defy meaningful correlation. In short, the simplest and most analytically useful course would be for the Commission to revert to its pre-Opinion No. 531 diffidence concerning reliance on State-regulated returns on equity.

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91 *Alabama Public Service Commission*, Docket Nos. 18117 and 18416, Order, 307 P.U.R.4th 291 (September 16, 2013). The specific calculation for the RSE is contained in an Alabama Power tariff. https://www.alabamapower.com/content/dam/alabamapower/Rates/RSE.pdf

F. Market-Based ROEs Have No Relation to Book Returns

Commission Questions:

F.1. Does the mismatch between market-based ROE determinations and a book value rate base support current market values? Is this mismatch a problem?

F.2. Why have most or all utility market-to-book ratios consistently exceeded one?

F.3. How should the ROE level be set relative to the cost of equity?

F.4. Should the Commission revise our use of these models to account for the mismatch between market-based ROE determinations and book-value rate base? If so, how? For example, should the Commission adjust the dividend yield used in the DCF model to represent a yield on book value rather than a yield on stock price?

F.5. Should the Commission consider adjusting ROEs to account for market-to-book ratios above or below one? Would doing so introduce circularity into Commission ROEs by setting the ROE at whatever level of earnings the market expected, rather than making an independent assessment of the appropriate ROE?

EMCOS Responses:

In Order No. 461, the Commission correctly found "compelling economic justification for relying on the market cost of capital as the standard for rate of return decisions"[92] in the observation that the requirements of *Hope* are satisfied by an ROE that reflects the cost of capital:

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[92] *Generic Determination of Rate of Return on Common Equity for Public Utilities*, Order No. 461, FERC Stats. & Regs. ¶ 30,722, at 30,499 & n. 189 (1987), *citing* Kolbe, Reed,

> [T]he cost of capital of a regulated firm represents precisely the expected return that investors could anticipate from other investments while bearing no more and no less risk, and since investors will not provide capital unless the investment is expected to yield its opportunity cost of capital, the correspondence of the definition of the cost of capital with the court's definition of legally required earnings appears clear. *Hope* refers to both: commensurate earnings and the attraction of capital. These two approaches are harmonized when the allowed rate of return is set equal to the cost of capital.

A return that fails to reflect the market cost of capital will either undercompensate or overcompensate the utility. "Under-compensation will not enable the regulated firm 'to maintain its credit and enable it to raise the money necessary for the proper discharge of its public duties', as set forth in *Bluefield*."[93] On the other hand, "over-compensation will unfairly exploit ratepayers."[94] There has been no showing in any of the Section 206 proceedings pending before the Commission, or in any other proceeding of which EMCOS are aware, that warrants a departure from the Commission's settled reliance on its estimate of the market cost of equity capital for the relevant utility or group of utilities as the appropriate measure of the just and reasonable ROE in any given case.

The Commission has also recognized that "Accounting rates of return are not reliable measures of the current market cost of capital, since they do not reflect the

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Jr. and Hall, *The Cost of Capital: Estimating the Rate of Return for Public Utilities* (1984) at 21.

93 Affidavit of Jonathan L. Lesser, Ph.D. in Docket No. EL11-66-005 (Exhibit No. EMC-0200, at P 13), filed January 11, 2019.

94 *Id.*

current market prices that are determined in competitive capital markets."[95] One reason for this limitation on the usefulness of accounting returns is the fact that they are frequently a function of a corporate choice of particular accounting methodologies that are neither uniform throughout the industry nor transparent to analysts.

Any "mismatch" between market-based ROE determinations and a book value rate base is neither a problem concerning, nor relevant to, establishing a just and reasonable ROE. The Commission "has consistently rejected attempts to set rate of return for the purpose of maintaining a specific, minimum market to book ratio" because:

> Many factors (including prevailing economic and market conditions, interest rates, investor confidence, international events, and inflation) affect stock prices, which are constantly changing. In light of the numerous and, to some extent, unpredictable factors affecting stock price, we know of no method for calculating a precise return that will ensure stock prices at or near per share book value.[96]

Therefore, the Commission should not attempt to "adjust" ROEs "to account for market-to-book ratios above or below one." The Commission has recognized the futility of such an exercise since the early 1980s, and no credible reason has been

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95 *Generic Determination of Rate of Return on Common Equity for Public Utilities*, Order No. 420, FERC Stats. & Regs. ¶ 30,644 at 31,367 (1985).

96 *New England Pwr. Co.*, Opinion No. 158, 22 FERC ¶ 61,123 at 61,190 (1983), *citing Boston Edison Co.*, Opinion No. 53, 8 FERC ¶ 61,077 at 61,285 (1979) (". . . considering the vagaries of the stock market and the sensitivity of stock prices to such unpredictable factors as prevailing economic and market conditions, interest rates, investor confidence, international events, and inflation, it seems clearly beyond the capability of statistical analysis, however sophisticated, to calculate the precise return on common equity which will cause the price of a utility's stock to sell at or near its per share book value").

suggested anywhere in the various proceedings pending before the Commission to deviate from this settled precedent.

G. First Prong of ROE Determination

Commission Questions:

G.1. How should the Commission determine if existing ROEs are just and reasonable?

G. 2. Is the quartile approach that the Commission proposed in the *Coakley* and MISO Briefing Orders appropriate? If not, how should the Commission revise this methodology?

EMCOS Responses:

The Commission should adopt an approach that appropriately considers the costs associated with an existing rate, current market indicators such as bond yields, and, in limited circumstances, non-cost factors to determine whether an existing rate is unjust and unreasonable. "Statutory reasonableness is an abstract quality represented by an area rather than a pinpoint. It allows a substantial spread between what is unreasonable because too low and what is unreasonable because too high."[97] This "zone of reasonableness" strikes a fair balance between the financial interests of the regulated company and the public interests, both existing and foreseeable.[98]

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97 *Montana-Dakota Util. Co.* v. *Northwestern Pub. Serv. Co.,* 341 U.S. 246, 251 (1951).

98 *Permian Basin Area Rate Cases*, 390 U.S. 747 at 792 (1968).

Whether an existing rate that falls within this "zone of reasonableness" remains just and reasonable depends on the "particular circumstances" of the case.[99]

In *Emera Maine*, the D.C. Circuit found the Commission did not satisfy the first prong of Section 206 because the Commission "'made no effort' to explain what circumstances rendered Transmission Owners' existing rate unlawful."[100] In other words, the Commission's error was failing to corroborate its cost analysis. Costs associated with an existing rate "often offer the principal points of reference for whether the resulting rate is 'less than compensatory' or 'excessive,'" and represent "the most useful and reliable starting point for rate regulation."[101] Corroborating a cost analysis by examining "changes affecting opportunities for investment, the money market and business conditions generally" is additional evidence the existing rate is unjust and unreasonable.[102] Further, in certain circumstances, non-cost factors may warrant a departure from a rigid cost-based analysis.[103] However, "each deviation from cost-based pricing [must be] found not to be unreasonable and to be consistent with the Commission's [statutory] responsibility."[104]

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99 *Bangor Hydro-Electric Co.*, 122 FERC ¶ 61,038 at P 11.

100 *Emera Maine*, 854 F.3d at 26.

101 *Farmers Union Cent. Exchange Inc. v. FERC*, 734 F.2d 1486, 1502 (D.C. Cir. 1984).

102 *Bluefield*, 262 U.S. at 693.

103 *Farmers Union Cent. Exchange Inc. v. FERC*, 734 F.2d at 1502.

104 *Mobil v. FPC*, 417 U.S. 283 at 308 (1974); *see FERC v. Pennzoil Producing Co.*, 439 U.S. 508 at 518 (1979).

As a result, an existing ROE must be evaluated against changes affecting opportunities for investment and the money market in the U.S. economy. Prof. Damodaran of NYU Stern School of Business showed the market cost of capital declined between 2004 and 2014 from 7.91% in 2004 to a low of 5.87% in 2014.[105] As a "utility's cost of equity is determined, at least in part, by comparison with other potential investments."[106] These indicators would support a finding that an existing ROE set prior to these decreases has become unjust and unreasonable. Additional economic indicators such as a significant decrease in prime interest rates and U.S. Treasury and public utility bond yields is also useful information to consider

The Commission proposal in the *Coakley* and MISO Briefing Orders (the "Quartile Proposal") to satisfy the D.C. Circuit's holding in *Emera Maine* fails to do so.[107] Under the Commission's Quartile Proposal, an "overall zone of reasonableness" is set by averaging several ROE analyses. This "overall zone of reasonableness" is then divided into quartiles; the lower quartile represents below-average risk utilities; the middle quartile represents average risk utilities; and the upper quartile represents high-average risk utilities. Upon determining a "utility's relative risk profile,"[108] the Commission proposes that the quartile that represents this risk profile

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105 See Dockets No. EL13-33 and EL14-86 at Exhibit EMC-0300 at PP 204-206.

106 *Coakley* Briefing Order, at P 29.

107 *Coakley, Mass. Att'y Gen. v. Bangor Hydro-Elec. Co.*, 165 FERC ¶ 61,030, P24 (2018); *Ass'n of Bus. Advocating Tariff Equity v. Midcontinent Indep. Sys. Operator, Inc.*, 165 FERC ¶ 61,118, PP 24-33 (2018).

108 *Coakley* Briefing Order, at 24.

would be treated as the "evidentiary zone of reasonableness."[109] The Commission explains this "evidentiary zone of reasonableness" represents the "broad range of potentially lawful ROEs"[110] applicable to a utility or group of utilities with the relevant "risk profile" that are "presumptively just and reasonable."[111]

There are four issues with the Quartile Approach. First, the Quartile Proposal does not satisfy the first prong of Section 206 because it makes "no effort' to explain what circumstances rendered a transmission owner's existing rate unlawful."[112] Second, the Quartile Proposal defies logic. As the zone of reasonableness represents the "broad range of potentially lawful ROEs,"[113] logic dictates there can only be one zone, i.e. one range of "potentially lawful ROEs." The Quartile Proposal's attempt to create two zones of reasonableness is unworkable and defies Court precedent.

Third, the Quartile Proposal errs in treating rates that fall within the proposed "evidentiary zone of reasonableness" as presumptively just and reasonable. Read literally, the Quartile Proposal would pretermit inquiry into the "particular circumstances" previously acknowledged by the courts and the Commission as warranting a finding that a rate within the so-called "zone of reasonableness" is

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109 *Coakley* Briefing Order, at 24.

110 *Coakley* Briefing Order, at 24.

111 *Coakley* Briefing Order, at 28.

112 *Emera Maine*, 854 F.3d at 26.

113 *Emera Maine*, 854 F.3d at 26.

nonetheless unjust and unreasonable.[114] *Emera Maine* holds rates within a "broad range of potentially lawful ROES," i.e. the zone of reasonableness, are not *per se just and reasonable*.[115] As the Commission previously explained, a presumptive zone of just and reasonable rates "would eliminate the Commission's statutorily prescribed role in resolving the 'intensely practical difficulties' inherent in 'reduc[ing] the abstract concept of reasonableness to concrete dollars and cents,' as well as nullify the Commission's mandate to ensure that rates are neither less than compensatory to the seller nor excessive to the consumer."[116] Such a presumption disregards the fact even "a small dent in the consumers pocket" is unjust and unreasonable.[117]

Fourth, and finally, the Quartile Proposal division of the zone of reasonableness into quartiles to create multiple zones that overlay an "overall zone of reasonableness" is completely arbitrary. The Commission never explains why it is best or more accurate to divide the "overall zone of reasonableness" by eighths rather than by some other amount. As such, the Commission has committed the exact same

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114 *Emera Maine*, 854 F.3d at 22 ("Whether a rate, even one within the zone of reasonableness, is unlawful depends on the particular circumstances of the case. * * * Neither the language of the FPA nor our precedents compel FERC to accept all rates within the discounted cash flow zone of reasonableness as just and reasonable in a section 206 proceeding"); *Bangor Hydro-Elec. Co.*, 122 FERC ¶ 61,038 at P 14 (2008) ("The Transmission Owners' argument reduces the 'zone of reasonableness' to little more than a declaration of optional rates, and, when followed to its logical end, results in the conclusion that the Transmission Owners should be free to charge any ROE within the zone").

115 *Emera Maine*, 854 F.3d at 27.

116 *Bangor Hydro-Electric Co.,*122 FERC ¶61,038 at P 14.

117 *FPC v. Texaco Inc.*, 417 U.S. 380, 399 (1974).

error the D.C. Circuit faulted the Commission for when it found the Commission failed to justify its placement of the Base ROE at the midpoint of the upper half.[118]

Accordingly, the Commission should not adopt its Quartile Proposal because it is directly contrary to the holdings in *Emera Maine*. Rather the Commission should adopt a flexible approach to determining whether an existing rate is unjust and reasonable that takes into the consideration the costs associated with an existing rate, current market indicators such as bond yields, and, in limited circumstances, non-cost factors. Such an approach would satisfy the D.C. Circuit's requirement that the Commission explain the circumstances that render an existing ROE unjust and unreasonable.

Commission Question:

G.3. When a successive complaint is filed while the current ROE is being adjudicated (i.e., a pancake complaint), should the subsequent complainant be required to make a *prima facie* showing of sufficient change in market conditions to meet the *Coakley* and MISO Briefing Order's proposed determination of whether an existing ROE remains just and reasonable? If so, what type of information or showing should the complainant provide to demonstrate that market conditions have changed, and what standard should the Commission apply when assessing whether to deny the subsequent complaint without setting it for hearing?

118 *Emera Maine*, 854 F.3d at 29-30.

EMCOS Response:

Commission policy already requires a complainant make a *prima facie* showing an existing ROE is just and reasonable to be entitled to an evidentiary hearing.[119] Complainants are required to present appropriate financial analyses of the current cost of equity or the Commission will reject ROE complaint.[120] The Commission permits the filing of a successive challenge to an ROE in recognition of the volatile nature of ROEs.[121] The Commission explained that when it accepts a complaint based on a new economic analysis, "it is not instituting a duplicative proceeding intended solely to expand the amount of refund protection beyond 15 months, but rather is initiating an entirely new proceeding, based on an entirely separate factual record."[122] The Commission has repeatedly explained the need to allow for successive complaints is "particularly critical given that what is at issue is return on equity, which, in contrast to other cost of service issues…can be particularly volatile."[123]

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119 *See e.g. Golden Spread Elec. Coop., Inc. v. Sw. Pub. Serv. Co.*, 151 FERC ¶ 61,126, PP 15-16 (2015); *Oklahoma Municipal Power Authority v. Oklahoma Gas & Elec. Co.*, 163 FERC ¶ 61,114, P 34 (2018); *ABATE v. MISO*, 149 FERC ¶ 61,049, P 184 (2014).

120 *See, e.g., Louisiana Public Service Commission v. System Energy Resources, Inc.*, 124 FERC ¶ 61,003, P 15 (2008) (dismissing ROE complaint that failed to present essential supporting data, "such as a list of the utilities in the comparison group or the DCF methodology used for the DCF analysis," and "only provided statistical evidence of a change in bond yields, without making clear what effect this information alone has on [the target utility's] cost of equity.).

121 *ENE (Environment Northeast)*, 151 FERC ¶ 61,125 at P 28.

122 *Golden Spread Elec. Coop., Inc. v. Sw. Pub. Serv. Co.*, 151 FERC ¶61,126, at P21 (2015) (internal citations and quotations omitted).

123 *Id.*; *See also Southern Company Services, Inc.*, 83 FERC ¶61,079, 61,386 (1998) (noting that "the legislative history [of the RFA] clearly indicates an intent to expand the protection afford consumers, not contract it"); *Consumer Advocate Div. of Pub. Serv.*

The record evidence in the *Coakley* complaint proceedings supports the Commission's prior observation. It is clear from the testimony that the cost of capital has continually decreased since the first Section 206 complaint was filed in Docket No. EL11-66. For example, EMCOS Witness Dr. Lesser conducted the Commission's previously preferred two-step DCF analysis for each period. The results of these analyses are as follows:

- For the Complaint I period, the range of implied costs of equity produced by the DCF analysis for each of the proxy group members identified in Appendix A to the Commission's Opinion No. 531 runs from 7.03 percent to 11.75 percent, with a midpoint of 9.39 percent and a median of 9.11 percent.[124]

- For the Complaint II period, the range of implied costs of equity produced by the DCF analysis for Dr. Lesser's proxy group runs from 7.12 percent to 10.42 percent, with a midpoint of 8.77 percent and a median of 8.81 percent.[125]

- For the Complaint III period, the range of implied costs of equity produced by the DCF analysis for Dr. Lesser's proxy group runs from 7.04 percent to 9.70 percent, with a midpoint of 8.37 percent and a median of 8.51 percent.[126]

- For the Complaint IV period, the range of implied costs of equity produced by the DCF analysis for each of the Study Period IV proxy group members identified in Appendix A to the January 7 Order (also excluding Emera for

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Comm'n of W. Va. v. Allegheny Generating Co., 67 FERC ¶ 61,288 at 62,000 (1994), *order on reh'g*, 68 FERC ¶ 61,207 (1994).

[124] Exhibit No. EMC-0200, FERC Docket No. EL11-66-000, Accession Number: 20190111-5120, at P 38, Table 1.

[125] Exhibit No. EMC-0300, FERC Docket No. EL13-33-000, Accession Number: 20190111-5120, at P 41, Table 1.

[126] Exhibit No. EMC-0300, FERC Docket No. EL14-86-000, Accession Number: 20190111-5120, at P 41, Table 2.

ineligibility) runs from 5.95 percent to 10.19 percent, with a midpoint of 8.07 percent and a median of 7.79 percent.[127]

The results show that between September 30, 2011, the date Complaint I was filed, and October 31, 2017, the last day of Complaint IV's study period, the cost of capital continually decreased. Thus, each Complaint period captured the volatility associated with returns on equity and ensured that customers would be protected from even "a small dent in the [their] pocket."[128] Accordingly, EMCOS sees no need to change the Commission's current approach.

To the extent the question is asking whether the Commission should increase a Complainant's burden for successive FPA Section 206 complaints, the Commission cannot do so. It is well settled that the burden of proof on the proponent of an order is a preponderance of the evidence.[129] Any attempt by the Commission to alter this burden would be an inappropriate effort at rewriting the Administrative Procedure Act and the Federal Power Act. Moreover, placing a higher burden on Section 206 Complainants to make a *prima facie* showing creates an inappropriate asymmetrical between the showings required of FPA Section 206 complainants and public utilities filing for unilateral changes in rate under FPA Section 205. This asymmetry contravenes both the structure of the Federal Power Act itself, under which "the statutory test of lawfulness is phrased in the same terms" in both Section 205 and

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127 Exhibit No. EMC-0400, FERC Docket No. EL16-64-000, Accession Number: 20190111-5120, at P 41, Table 1.

128 *FPC v. Texaco Inc.*, 417 U.S. 380, 399 (1974).

129 *Dir. v. Greenwich Collieries*, 512 U.S. 267, 276-278 (1994); *Steadman v. SEC*, 450 U.S. 91, 101-102 (1981); *San Diego Gas & Elec. Co. v. Sellers of Energy and Ancillary Svcs.*, 149 FERC ¶ 61,116 at PP 45-46 (2014).

Section 206,[130] and the Regulatory Fairness Act ("RFA") amendments to Section 206(b), which were precisely intended to create symmetry between public utility rights under FPA Section 205 and consumer rights under Section 206.[131]

The Commission "consistently interpret[s] the Regulatory Fairness Act—in the specific context of public utility ROE cases—to allow subsequent complaints" where a new ROE complaint is supported by a new DCF analysis.[132] In analyzing the legislative history of the RFA, the Commission explained Congress implemented the RFA in recognition of the fact that "utilities are free to file for successively higher rate increases based on later common equity cost data without regard to the status of their prior requests" and that a "fair symmetry requires that complainants also be free to file complaints requesting further rate decreases based on later common equity cost data without regard to the status of their prior complaints."[133] Senator Bumpers explained on the Senate floor the RFA "would address this inequity by establishing more symmetry between the procedures for rate reductions and rate increases."[134]

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130 *Boston Edison Co. v. FERC*, 233 F.3d 60, 64 (1st Cir. 2000).

131 *Consumer Adv. Div. of Pub. Svc. Comm'n of W. Va. et al. v. Allegheny Gen. Co.*, 67 FERC ¶ 61,288, at 62,000, *order on reh'g*, 68 FERC ¶ 61,207, at 61,997 & nn. 2-3 (1994).

132 *Golden Spread Elec. Coop., Inc.*, 151 FERC ¶61,126, at P 21 (internal citations and quotations omitted). *See also Southern Company Services, Inc.*, 83 FERC ¶61,079, 61,386 (noting that "the legislative history [of the RFA] clearly indicates an intent to expand the protection afford consumers, not contract it"); *Consumer Advocate Div. of Pub. Serv. Comm'n of W. Va.*, 67 FERC ¶ 61,288, at 62,000.

133 *Id.*

134 134 Cong. Rec. 22,907 (statement of Sen. Dale Bumpers).

Thus, any suggestion of an increased hurdle to additional Section 206 proceedings violates Section 206 and the expressed purpose of the RFA.

Commission Question:

G.4. In single utility rate cases, the Commission determines the central tendency of the zone of reasonableness based on the median of the proxy group ROEs. Is the approach outlined in the *Coakley* and MISO briefing orders appropriate in single utility rate cases given that the proxy company ROEs tend to cluster near the center of the zone of reasonableness, making the middle quartile relatively narrow?

G.4.a. Would it be reasonable to determine the central tendencies of the upper and lower halves of the zone of reasonableness for single utilities based on a midpoint analysis, so as to produce approximately equal ranges of presumptively just and reasonable ROEs for below average, average, and above average risk utilities?

EMCOS Responses:

Please see EMCOS' response to Questions G.1 and G.2. As further discussed in those responses, the Commissions Quartile Proposal is inappropriate and would contravene the D.C. Circuit's explicit holdings in *Emera Maine*.

H. Model Mechanics and Implementation

1. General Issues/issues that affect multiple models

Commission Questions:

H.1.1. Are IBES data a good proxy for "investor consensus?"

H.1.1.a. If not, are there better alternatives, such as Bloomberg, Zacks, S&P Capital, Morningstar, and Value Line?

H.1.1.b. Should the Commission combine data from multiple sources?

H.1.1.c. What weight, if any, should be given to an estimate if the number and identity of analysts contributing to the estimate is not available?

EMCOS Response:

The Commission must balance several factors when deciding upon which data sources it will rely. Those factors include whether the data is publicly available, whether the source is regularly updated, and whether it represents a consensus opinion or that of a single analyst. Additionally, the Commission must consider the burden associated with permitting multiple data sources because each new data source will require an additional analysis that parties will perform, and the Commission will have to review.

IBES estimates are published by Yahoo!Finance and available free of charge, making them appealing to investors who widely rely on the data. As such, these estimates will influence investor expectations. Moreover, they are relied on by consumer groups who file complaints under Section 206 of the Federal Power Act. If the Commission requires the use of alternative data sources, such as subscription sources costing thousands of dollars, it will increase the burden on consumer groups and municipal utilities, many of whom simply lack the resources to afford such subscriptions.

In Docket No. EL16-64, the NETOs' witness Mr. McKenzie put forward DCF analyses supported by four different subscription data sources. EMCOS witness Dr.

Lesser investigated the cost of these services and was quoted the following costs to subscribe:[135]

- S&P Capital IQ: Subscription cost based on firm size, with a cost of between $15,000 to $20,000 for a firm the size of Dr. Lesser's. Only annual subscriptions offered.

- Nasdaq IR Insight: $15,000 for a subscription to their FirstCall database. Only annual subscriptions offered.

- Bloomberg: $2,140 per month for a single license agreement, with a minimum 2 year contract, renewing at 2 year intervals, equivalent to an annual cost of $25,680.

- FactSet: Quoted $30,000 for an annual subscription, but confirmed actual cost would be based on an evaluation of firm size and characteristics. Only annual subscriptions offered.

Additionally, an annual subscription to Thomson Reuters Eikon costs $20,000/year.[136]

Requiring the use of these subscription-based services creates an obvious financial burden to parties to actually litigate a Section 206 complaint, but the burden is more pernicious than that. Because these services require annual subscriptions, any party even *considering* a Section 206 challenge would have to pay the subscription price to even conduct a preliminary examination of whether an existing ROE remains just and reasonable. Further, parties would be required to maintain subscriptions in order to be able to evaluate the reasonableness and accuracy of any

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135 Docket No. EL16-64, Exhibit EMC-0094, Supplemental Testimony of Jonathan A. Lesser, at 2 (Dec. 14, 2017).

136 Eric Huffman, "Best Alternatives to Bloomberg Terminal," Benzinga., June 10, 2019. https://www.benzinga.com/money/best-alternatives-to-bloomberg-terminal/

ROE proposed by a utility in the context of a Section 205 filing. Such a financial burden would be in top of the burden associated with being required to perform and support additional analyses using these different growth rate sources and engaging in the inevitable litigation over which result should be considered more reliable. Finally, the public availability of the IBES growth rates published on Yahoo!Finance means that more investors are likely to rely on them than to rely on extremely costly financial data subscription services.

Morningstar and Value Line are individual, not consensus, estimates. They do not represent the "consensus" among multiple analysts the Commission claims it is looking for. The ValueLine published earnings growth forecasts on the left-hand side of ValueLine reports begin from a base year two years in the past and extend for six years. Moreover, the published forecast earnings growth rates do not necessarily comport with the dollar value earnings forecasts ValueLine reports provide. "Averaging" IBES and ValueLine estimates, whether via a simple average or some sort of weighting methodology based on the number of IBES analysts, simply increases the arbitrariness of the resulting growth rates. Relying on ValueLine estimates to develop the Expected Earnings model, as the NETOs have proposed, provides a disproportionate weight to a methodology that isn't market-based.

Commission Question:

H.1.2: To what extent does model risk affect all ROE methodologies?

EMCOS Response:

It is unclear that model risk affects ROE methodologies at all. The Commission has admitted it does not know the mechanism by which model risk would affect the DCF model inputs; it does not know which DCF inputs are affected; it does not know the magnitude of the effects of such "model risk," and it cannot explain why other methodologies, such as the CAPM, which rely on a DCF model to estimate an expected market return and which use beta values that are based on movements in stock prices, are not themselves affected by "model risk."[137]

Applying Occam's razor, the rationale for the Commission's finding of "model risk" appears to have been an exercise in avoiding the obvious: that the market cost of capital declined after the 2008 financial crisis. The fact that DCF estimates have shown decreasing costs of capital is not a modeling error; it is an obvious consequence of the decline in the market cost of capital that has taken place since 2008. However, to the extent that model risk is a concern, the best remedy is to consider the results of multiple *correctly applied* market-based methodologies.

Commission Question:

H.1.3. The DCF model incorporates data at the parent/holding company level (*e.g.* stock price). The Commission adjudicates cases at the operating company level,

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137 *See e.g.* Opinion No. 551, 156 FERC ¶61,234 at P 124 (In concluding that the "anomalous" capital market conditions relied on in Opinion No. 531 had persisted into the Opinion No. 551 study period, the Commission stated that it "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 which there is no public data like stock prices, growth rates, and betas. What impact does this disparity have on the results of the DCF and other models?

EMCOS Response:

If a parent/holding company's business is wildly different than that of the operating company, this issue is best addressed through the proxy group screening criteria. Similarly, the parent company likely should be excluded from the proxy group to avoid problems of circularity: the operating company's allowed ROE will affect the parent's overall return, and basing the operating company's allowed ROE, in part, on the return expectations of the parent, thus introduces unavoidable circularity.

Commission Question:

H1.4: Should the Commission continue to rely on the efficient market hypothesis, which underlies the DCF and CAPM models? Why or why not?

H.1.4.a. If yes, should the Commission continue to employ outlier screens, M&A screens, etc., for the DCF and CAPM models since these models need to incorporate all relevant information?

EMCOS Response:

The Efficient Market Hypothesis (EMH) is a fundamental aspect of finance developed a half-century ago by the Nobel prize-winning economist Eugene Fama. (It is also known as the Fundamental Theorem of Finance.) If the Commission were to assume that capital markets were not efficient, then it would also have to believe there are opportunities for unlimited arbitrage. This is untenable, as the Court of

Appeal has recognized in rejecting a Commission decision that would violate the EMH:

> More generally, the Commission's lag theory implies a frontal assault on 'the cornerstone of modern investment theory,' the Efficient Market Hypothesis. In its 'semi-strong' form, the hypothesis says that stock prices will react promptly to new public releases of information and thus 'fully reflect all public information.' If, as the Commission urges, the market cannot promptly digest information about interest rates, it must be quite inefficient. In fact, if the stock market is such a laggard as the members of the Commission say, they would do well to abandon their regulatory work and turn to exploitation of their theory. At the conclusion of any sharp change in interest rates, they could buy stocks or sell them short, as appropriate, and then await the market's leisurely response - the Commission claims it may take more than six months. That investors can have been so obtuse as to miss this opportunity - and thus compete away the resulting profits - strains credulity.[138]

The use of outlier screens is important, especially if the Commission continues to rely on the use of midpoints, which EMCOS suggest the Commission not do. Midpoint values are determined solely by outliers. Hence, a statistically valid screening test for outliers is crucial. As stated previously, EMCOS strongly urges the Commission to abandon the use of the midpoint entirely, and rely solely on median values, subject to established Commission criteria for deviating from the median if there are substantive differences between the business and financial risk of the proxy group, and the business and financial risk of the subject company or groups of companies.

Size of the proxy group also affects the influence of outliers, even when using the median. Hence, EMCOS believe that high-value outlier tests remain necessary.

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[138] *Tennessee Gas Pipeline Co. v. FERC*, 926 F.2d 1206, 1211 (D.C. Cir. 1991) (internal citations omitted).

EMCOS believes the Commission's existing low-value outlier test is sound. As discussed previously, EMCOS recommends the Commission adopt the Grubbs test, which is well-known and used in applied research.

The Commission should also continue to rely on its existing proxy group criteria. First, the Commission should clarify whether the bond yield criterion requires *both* the S&P and Moody's bond ratings to be within one "notch" of the company or group of companies under review, or whether the criterion is "either/or." Second, the Commission should err on the side of caution when addressing M&A activity. That is, if, during the six-month study period, a company was involved in M&A activity, it should be excluded unless it can be proven that the company's share price and earnings growth forecasts were not significantly (in a statistical sense) affected. EMCOS recommends the use of event studies for such evaluations.[139]

Commission Question:

H.1.5: Should growth rates be based on Value Line, IBES, or alternative estimates?

EMCOS Response:

Please see the response to Question H.1.1. above.

[139] *See* Response to Question D.8.

H2: Model-specific questions.

DCF Methodology

Commission Question:

H.2.a.1. Should the Commission continue to use a dividend DCF model or should the Commission use a different DCF model, for example, one based on free cash flow?

EMCOS Response:

The DCF model used by the Commission is based on the premise that earnings growth is the ultimate determinant of dividend payments. The entire premise of all DCF methodologies is that the present value of all future cash flows to investors equals the current market price of a stock. Those cash flows are actual ones, equal to dividend payments (ignoring stock price appreciation when sold).

Free cash flow is purely an accounting concept and therefore is inappropriate to use in a DCF model. Stock investors do not receive quarterly payments of "free cash flow;" they receive dividends. Free cash flow excludes non-cash expenses and includes spending on assets. Free cash flows are more difficult to forecast than dividends. Hence, use of free cash flow rather than dividends would introduce more uncertainty and error in the DCF estimates.

As such, even if one could use the DCF with free cash flows instead of dividends, such estimates would obviously be affected by the timing of investment decisions. Moreover, EMCOS are not aware of any analysts who provide long-term (five-year) forecasts of free cash flows.

Commission Question:

H.2.a.2. Could terminal stock value be used in place of long-term growth projections? If so, how should terminal stock value be determined?

EMCOS Response:

Mathematically, a terminal stock value would be based on future projections of earnings, based on the fundamental nature of the DCF methodology. In a similar context, the Commission eschewed reliance on competing predictions of future events, reasoning correctly that "such predictions of the future are not well-suited to litigation where the witness for each party is likely to choose from among reasonable alternatives, those data and methodologies that most favor his or her client's financial interest, and there are no objective criteria for the Commission to make distinctions between what will be the equally well-reasoned and well-supported judgments of the equally well-credentialed experts"[140] For similar reasons, there is no benefit to the use of a terminal stock value in place of the Commission's current use of long-term growth rates that would offset the substantial additional complexity and controversy involved in determining a terminal stock price. It appears to EMCOS that the suggested move to use of terminal stock prices is simply a solution looking for a problem.

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140 *Williston Basin Interstate Pipeline Co.*, 79 FERC ¶ 61,311 at 62,390 (1997), *remanded on other grounds sub nom. Williston Basin Interstate Pipeline Co. v. FERC*, 165 F.3d 54 (D.C. Cir. 1999).

Commission Question:

H.2.a.3. Do investment analysts project earnings/dividends growth beyond five years, and if not, why not, and is GDP an appropriate proxy for long-term growth?

EMCOS Response:

EMCOS do not know whether analysts forecast beyond five years. Whether they do or not is of no consequence. The underlying issue is one of sustainability. As the Commission itself noted in *Bangor Hydro-Electric*, very high short-term earnings growth are not sustainable forever.[141] This same point has been made by Roger Morin in his textbook, *New Regulatory Finance*.[142]

EMCOS believe that GDP is the appropriate long-term rate of growth for the simple reason, again elicited by Prof. Morin, that in the long-run, no company can grow faster than the overall economy. This also points out why the Commission's apparent acceptance of short-term growth rates to use as the estimate of the return in the market as a whole are incorrect; in the long run, the market as a whole cannot grow faster than the economy because the market *is* the economy.

Commission Question:

H.2.a.4. How should the Commission weight short-term and long-term earnings/dividend growth projections?

EMCOS Response:

EMCOS recommend that the Commission adopt a two-stage DCF methodology. The two-stage methodology typically assumes short-term growth rates

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141 109 FERC ¶ 61,147, at P 205 (2004).

142 Roger Morin, *New Regulatory Finance*, at 308.

for three to five years, based on analyst growth rate estimates over that same period, and then uses a long-term rate based on growth in the overall economy. Under the Commission's current weighted DCF methodology, which is based on a 50-year time frame, the two-thirds weight assigned to the short-term growth rate implies a belief that short-term rates can continue for 33 years, followed by growth at the overall rate of economic growth for the subsequent 17 years. Companies simply do not grow at high rates for such extended periods.

Commission Question:

H.2.a.5. The Commission uses a constant growth DCF model. Should the Commission consider using a multi-stage DCF model? If so, how would the Commission determine the length of each stage of a proxy company's growth?

EMCOS Response:

Please see the response to Question H.2.a.4, above.

Commission Question:

H2.a.6. Are six months of average high/low historical monthly stock prices an appropriate measure for the current stock price "P"?

EMCOS Response:

Under the EMH, the price of a company's stock today reflects expectations about the future. EMCOS recognize, however, that relying on a single day's stock price to estimate allowed ROE using the DCF methodology would invite gaming by analysts to determine the "best" days for estimation.

EMCOS believes that a six-month period is reasonable to eliminate gaming of stock prices, while reflecting relatively current market conditions. A more

substantial issue is the time between when an evidentiary proceeding is completed and when the Commission issues a decision. The Commission often waits years to issue an order setting an allowed ROE, by which time all of the ROE analysis in the evidentiary record is stale. Quicker Commission action would additionally alleviate the alleged "pancaked" rate case problem that concerns the Commission.

CAPM

Commission Question:

H2.b.1. If the market risk premium is determined by applying the DCF methodology to a representative market index, should a long-term growth rate be used, as in the Commission's two-step DCF methodology?

EMCOS Response:

The Commission does not use a "two-step DCF Methodology." Rather, the Commission applies a weighted growth methodology for which short-term growth rates are assumed to continue for 33 years, with long-term growth thereafter.

EMCOS believes that a true two-stage DCF model should be used to estimate the return in the market. This approach is used by academicians (e.g., Aswath Damodaran) and by finance companies (e.g., Duff & Phelps) to estimate expected market returns and is therefore a more realistic estimate of the market cost of equity capital.

Commission Question:

H2.b.2. Beta is a measure of a security's risk relative to the broader market, such as the S&P 500, not of its absolute risk. Do CAPM's assumptions break down if

both utility stocks and the broader market become riskier over time on an absolute basis, but the relative increase in risk in utility stocks rises more slowly?

EMCOS Response:

The question appears to reveal a fundamental misunderstanding of the CAPM. The CAPM assumes that company-specific risk can be diversified. The only risk that cannot be diversified away is that of the economy as a whole (market or "systematic" risk).

Nothing in the CAPM assumes the "absolute risk" in the market remains constant. Nor is it clear what the Commission means by "absolute risk." Is the Commission referring to some measure of volatility? If so, what measure?

Because the cost of capital is properly considered as an opportunity cost, then the relative attractiveness of investing in utilities will be based on the alternative. If "absolute risk" (however that term is defined by the Commission) increases in the market, but "absolute risk" of utilities increases more slowly, then utilities will be relatively less risky than the market as a whole. Investors, therefore, will be more willing to invest in utilities, meaning that utilities' cost of capital will decline relative to the market as a whole. Nothing about that hypothetical phenomenon requires or suggests any modification to the CAPM analysis.

Commission Question:

H.2.b.3. What are appropriate data sources for the beta value?

EMCOS Response:

EMCOS believe Value Line betas, which are "adjusted" to reflect individual company betas to revert to the market beta of 1.00 over time, are appropriate to use.

Because different financial firms estimate beta values using different methodologies (e.g., using three years of weekly returns, five years of monthly returns), beta values cannot be "mixed and matched" from different sources.

Alternatively, the Commission could also set out a specific beta estimation methodology for all analysts to use. Such a method would specify the type of data, the duration of those data, the calculation of return (e.g., actual, log-values), and the use of an adjustment mechanism (e.g, Blume, Vasicek). Given the complexities of such analysis, however, the EMCOS suggest continued use of Value Line published betas.

Commission Question:

H.2.b.4. Should the Commission employ more sophisticated versions of the CAPM model that consider more variables instead of only beta, such as the Fama-French Model?

EMCOS Response:

EMCOS do not object in principle to the use of multiple-factor models, such as Fama-French or use of the Arbitrage Pricing Model. However, the Commission's observations concerning its adoption of its current, weighted average growth rate approach rather than a multi-stage DCF bear repeating here:

> The Commission has determined not to use the investment house approach, because the calculations are far more involved, requiring the exercise of subjective judgment. Stage 2 of the analysis requires a determination of the length of the transition stage and the rate of decline. An investment analyst attempting to predict the future course of a firm's business has an incentive to make the best assessment possible so that his or her clients will make a wise investment. But such predictions of the future

> are not well-suited to litigation where the witness for each party is likely to choose from among reasonable alternatives, those data and methodologies that most favor his or her client's financial interest, and there are no objective criteria for the Commission to make distinctions between what will be the equally well-reasoned and well-supported judgments of the equally well-credentialed experts.[143]

Moreover, use of such multi-factor models increases the complexity and cost for complainants, who may not have the resources to engage experts to perform such analysis, and for the Commission, whose efforts to resolve these increasingly complex issues is likely to prove time-consuming and controversial. As such, adopting more complex models will increase the difficulty for the Commission to determine just and reasonable ROEs in all cases, and for consumers to use FPA Section 206 where necessary to vindicate their rights to a just and reasonable ROE.

Expected Earnings

Commission Question:

H.2.c.1. Should the use of utilities in the proxy group for the Expected Earnings model be predicated on the Expected Earnings analysis being forward-looking?

EMCOS Response:

The Commission should abandon the Expected Earnings model entirely. The Expected Earnings model is no different than the Comparable Earnings model the Commission properly rejected over three decades ago, and the methodology has been

143 *Williston Basin Interstate Pipeline Co.*, 79 FERC ¶ 61,311 at 62,390 (1997), *remanded on other grounds sub nom. Williston Basin Interstate Pipeline Co. v. FERC*, 165 F.3d 54 (D.C. Cir. 1999).

thoroughly discredited in the academic finance and economics literature.[144] The Expected Earnings model, as implemented in the *Coakley* Briefing Order is based on Value Line projections of book earnings. But those projections are based on historic allowed returns. Thus, as noted previously in these Comments, the Expected Earnings analysis is inherently *backwards* looking. The Expected Earnings model is based on accounting returns and bears no relationship whatsoever to the market cost of equity capital. Nor is the Expected Earnings model used by institutional investors.

Commission Question:

H.2.c.2. What, if any, concerns regarding circularity are there with using the Expected Earnings analysis to determine the base ROE, as opposed to using the analysis for corroborative purposes?

H.2.c.2.i. If there are circularity concerns, are there ways to mitigate these concerns for the Expected Earnings analysis? If these concerns exist, are these concerns more significant than those surrounding the DCF methodology, which effectively separates Expected Earnings and ROE into its dividend yield and growth rate subcomponents?

EMCOS Response:

Please see the previous response regarding the rejection of the Expected Earnings model in its entirety.

The Commission's question further states that the DCF methodology separates "Expected Earnings and ROE into its dividend yield and growth rate

144 *See supra*, note 15.

subcomponents." This makes no sense. The DCF methodology is market-based; the Expected Earnings model is not. The DCF methodology does not "separate expected earnings and return into dividend yield and growth rate components." Fundamentally, the DCF methodology is based on the Efficient Market Hypothesis, specifically that the price of a stock today equals the present value of all future cash flows. The dividend yield appears in the DCF formula simply as a consequence of algebraic manipulation of the basic equation underlying the DCF methodology:

$$P_0 = D_0 + D_1/(1+r) + D_2/(1+r)^2 + ... + D_T/(1+r)^T + ...$$

The "separation" the Commission refers to is simply the result of solving for "r" in the equation above when D_t is assumed to grow at a constant rate, g.

Risk Premium

Commission Question:

H.2.d.1. Should the analysis be historical or forward-looking?

EMCOS Response:

The cost of capital is a forward-looking concept. Therefore, the risk premium model should not be based on historic data. It should especially not be based on the false regression methodology the Commission pointed to in the *Coakley* Briefing Order. The risk premium model is properly viewed as being based on the same fundamentals as the CAPM. An appropriate risk premium methodology, therefore, should be based on current utility bond yields, which under the EMH reflect investors' expectations about the future; and the equity risk premium, which equals the expected market return less the average bond yield. The equity risk premium, in

turn, must be adjusted for the relative riskiness of the proxy group to the market as a whole. (The expected market return must be estimated properly, as discussed above, using a two-stage DCF model.) As Morin points out, a common approach to adjusting for risk is to use the average beta for the proxy group.[145]

Commission Question:

H2.d.2: Is a Risk Premium analysis compatible with a finding of anomalous capital market conditions? Why or why not?

EMCOS Response:

The Commission would be well-served to abandon entirely its fiction of "anomalous" capital markets. It is now over 10 years since the beginning of the financial crisis in 2008. The Commission has never provided an empirical definition of "anomalous" capital markets, instead assuming that they arise when bond yields fall below some unknown and unspecified threshold value.

Commission Questions:

H.2.d.3. Unlike the financial models discussed above, the Risk Premium analysis produces a single ROE rather than a zone of reasonableness. Does this characteristic require the Commission to use the Risk Premium model differently than the other models?

H.2.d.3.i. Is there a method by which the Risk Premium ROE could be adjusted upward for an above average utility or downward for a below average risk utility? If not, is it reasonable to consider the results of a Risk Premium analysis when determining the ROE of an above or below average risk utility?

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145 Roger Morin, *New Regulatory Finance*, at 119-120.

H.2.d.3.ii. Is it appropriate to use a Risk Premium analysis when conducting the first prong of the section 206 evaluation?

EMCOS Response:

First, the Commission should abandon its flawed regression-based methodology, which as noted previously,[146] is backward looking, based on ill-defined data, and fails to account for business and financial risk whatsoever.

Second, to the extent the allowed ROE is based on the median of the proxy group range of reasonableness (after addressing low-value outliers using the Commission's existing approach and high-value outliers using a statistically-valid method such as the Grubbs test), then the median values can be averaged. Or, a better approach, as recommended by the EMCOS, would be to average the individual methodology estimates (e.g., averaging the DCF and CAPM values for each proxy group, after eliminating outliers), determine the resulting median value of this new range of reasonableness, and then weigh the resulting median with the RP estimate. EMCOS recommend a weight of 2/3 for the DCF-CAPM median and a 1/3 weight for the RP estimate because the DCF-CAPM median reflects the results of two methodologies.[147]

Finally, the Commission's Section 206 evaluation is based on a flawed quartile analysis. As noted previously, it is possible for the resulting averaged median value to lie outside the corresponding quartile range. The Commission apparently has not

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146 *See* Section II.C. and response to Question H.2.d.1.

147 *See e.g.* Docket No. EL11-66 Exhibit EMC-0200 at P 37.

recognized this issue. Moreover, whereas the *Coakley* Briefing Order set out how to specify the risk-based quartiles when the midpoint is used, it never did so for the median.

Respectfully submitted,

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Dated at Washington, D.C.
This 26th day of June, 2019.

Appendix

APPENDIX
DOCKET Nos. EL16-64-000 *et seq.*, PL19-3-000 and PL19-4-000

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DESCRIPTION

The Eastern Massachusetts Consumer-Owned Systems ("EMCOS") are each Massachusetts municipal light plants, organized and existing under and by virtue of Mass. Gen. Laws c. 164 §§ 34-69, and engaged in providing electric service at retail within their respective communities. The EMCOS are the Complainants in Commission Docket No. EL16-64-000 *et seq.* – *Belmont Municipal Light Dept. v. Central Maine Power Co.* The number of customers and meters, local network and 2014 Average Monthly Peak for each of the EMCOS is shown in the following table.

EMCOS System	No. of Meters	Local Network	Average Monthly Peak (2014) (MW)
Belmont	11,274	NStar	22.597
Braintree	16,199	NStar	63.335
Concord	8,100	NStar	30.088
Georgetown	3,400	New England Power	9.127
Groveland	2,862	New England Power	6.357
Hingham	9,529	NStar	36.668
Littleton	6,519	New England Power	42.864
Middleborough	16,222	New England Power	44.204
Middleton	3,597	New England Power	17.035

EMCOS System	No. of Meters	Local Network	Average Monthly Peak (2014) (MW)
Reading	29,538	NStar/NEP	117.436
Rowley	2,873	New England Power	8.033
Taunton	36,622	New England Power	109.471
Wellesley	10,011	NStar	45.115
Totals	156,746		552.330

Exhibit No. EMC-001

Alternative rate of return concepts and their implications for utility regulation

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Bell Journal of Economics and Mgmt. Science 1 (1970).

The rate of return on invested capital is a widely used concept in both regulated and unregulated sectors of the economy. It provides a measure of actual performance as well as required or expected performance (the latter is often termed the "cost of capital"). In the utility field, regulatory agencies often focus on the rate of return as a major instrument for assessing and controlling the performance of firms under their jurisdictions. Unfortunately, two altogether distinct units are employed for measuring rate of return: (1) book rate units and (2) discounted cash flow units. Rarely will the two produce the same result, and the use of one measure as a surrogate for the other may prove highly misleading. This paper indicates the relationship between the two measures and shows the impact of some variations in depreciation and expensing procedures, growth rate, etc. The object is to point out the potential hazards associated with the use of measures of different things in a context that requires the use of measures of the same thing.

■ The rate of return on invested capital is a central concept in financial analysis. It is widely used as a basis for decisions, both in the unregulated sector and in utility regulation. One essential process for both purposes is an intercomparison between two facets of the rate of return measure:

(1) One facet is a summary measure of actual or prospective performance i.e., a measure of the annual rate at which each unit of capital input generates net financial benefits.

(2) The second facet is a summary measure of a "required" annual rate i.e., the financial standard or target rate against which the performance of prospective or already committed capital inputs can be assayed. In this second form it is also called "the cost of capital" rate.

When factor prices (other than capital) and product prices are taken as given, (as in the competitive pricing model), an intercomparison of these two facets of rate of return determines changes in the level of capital inputs. If, on the other hand, the scale of existing and future investment and factor prices (other than capital) are taken as given (as in the administered pricing model), then an intercomparison of these two facets determines product pricing decisions.

Professor Solomon holds the A.B. degree, with honors (University of Rangoon, 1940), and the Ph.D. degree (University of Chicago, 1950). He was on the faculty of the University of Chicago Graduate School of Business from 1948 to 1960, and was appointed Professor of Finance in 1957. He has been with the Graduate School of Business at Stanford University since 1961, first as Professor of Finance and Director of the International Center for the Advancement of Management Education (1961-'64), and as Dean Witter Professor of Finance since 1965.

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Thus, large companies may set prices in order to achieve a target rate of return,[1] and the thrust of utility price regulation is to provide utilities an opportunity to earn some "fair" rate of return on investment.

If the "rate of return on investment" were itself a single, unambiguous concept, the only difficulties we would encounter in using it for either purpose would be difficulties involving correct estimation of the measure. But the concept is not unambiguous: quite apart from trivial variants such as pre-tax vs. post-tax measures or a total capital vs. an equity capital basis for the concept,[2] there is a non-trivial problem which arises from the fact that "rate of return" is measured in terms of two altogether distinct units: book rate units, and discounted cash flow units.

□ **Book rate units.** These are more properly called book-ratio units. The "rate" being measured is defined as the ratio of income during a given period of time (as defined by the usual accounting measure of this term) to the net book-value of invested capital outstanding during the period (as defined by the balance sheet corresponding to the income statement from which the numerator is derived).[3] This version of the rate of return will be symbolized as b, and it represents the most commonly used basis for reporting and analyzing "rate of return on invested capital."[4]

□ **DCF units.** Unlike the book-ratio, this measures the return on capital in terms of the annual rate at which the "future" (actual or prospective) net funds flows (or cash flows as these are commonly called) from an investment have a discounted value equal to the value of the investment outlays required to bring about these funds flows. Hence the name DCF units, which refers to the "discounting cash flows" process required to calculate this version of rate of return on investment.

This basis for measuring rate of return is the most commonly used one for theoretical purposes. It will be symbolized by the letter r.[5]

Conceptual differences between the DCF rate and the book-ratio

■ There are three major conceptual differences between the two measures, b and r.

(1) The book-ratio, b, defines its flow variable (income) as "cash flow" (meaning funds flow) minus depreciation and minus the expensed portion of current period investment. In contrast, the DCF rate, r, defines the flow variable as "cash flow" before these two adjustments.

(2) The book-ratio, b, defines its stock variable (investment) as the net book value of capital as this would appear on the balance

[1] See [9].

[2] These are trivial in the sense that they are obvious and therefore lead to no confusion. To simplify the exposition, I shall ignore these two potential differences in definition by assuming, throughout most of this paper, that income taxes and long-term borrowing do not exist.

[3] Another potential, but trivial, ambiguity arises from the fact that we can measure the accounting net book value figure on a beginning-of-period basis, an ending-of-period basis, or somewhere in between.

[4] For reporting, see *Fortune's* 500 Largest Industrials Directory; *Fortune's* 50 Largest Firms in Merchandising, Banking and Transportation; FTC-SEC Quarterly Financial Report on Rates of Return in Manufacturing; First National City Bank of New York's Annual Return on Capital series; FPC and other regulatory agencies' Annual Reports on "Return on Investment."

For analysis, see [3], [8], [11], and [18].

[5] For prospective investments it is equal to the expected marginal productivity of capital (or the marginal efficiency of capital in Keynesian analysis), or the "initial rate of return." For investments in long-term bonds it is called the "effective yield to maturity."

sheet consonant with the definition of the income variable, i.e., the balance sheet number, which is linked by the inexorable rules of double-entry accounting to the income definition. In content, the DCF rate, r, defines the stock variable (investment) as the total initial outlay of funds required for generating the cash flows counted on the flow side of the equation.

(3) Finally, the book ratio, b, defines the rate of return in a given period of time, or over a period of time, as the arithmetic ratio of its flow variable to its stock variable. In contrast, the DCF rate, r, defines the rate of return as that rate of compound discount (or interest) at which the time adjusted (present) value of the flow variable (cash or funds flows) is equal to the time adjusted (present) value of the stock variable (investment outlays).

Given these basic differences in definition between b and r, it is highly unlikely that their numerical values will be equal. Yet both carry the same label "percent per annum rate of return on investment," and the two are frequently used as if they were freely congruent and interchangeable measures of the same thing. Some examples are:

1. For a single company or industry the rate, b, is often treated as if it were an unbiased measure of r;

2. When several companies or industries are analyzed it is generally assumed that differences in b reflect corresponding differences in r;

3. Estimates of fair or reasonable rates are often calculated in DCF units, i.e., in terms of the r measure, and applied to net book value estimates without regard to the essential differences between DCF units and book rate units. Alternatively, a company may set its required rate of return for *ex-ante* capital budgeting purposes in terms of DCF cost of capital units and then measure *ex-post* performance in terms of book rate units.

These, and other forms of confusion between the two conceptually and numerically different yardsticks, can and do lead to considerable confusion in many forms of investment analysis, both in the unregulated sector and, more particularly, in utility regulation.

The rest of this paper is an attempt to explore the nature and magnitude of the differences between the r version and the b version of rate of return measurement and, on the basis of this analysis, to examine potential uses and misuses of the two concepts for interpretive and regulatory purposes.

Measuring performance: the DCF rate of return

■ For a single investment project, the DCF rate, r, is defined as the rate at which net cash flows from the project, over its productive life, have a present value equal to the original investment outlay required by the project. Thus if:

C_0 = investment outlay at time $t = 0$,
$F_t (t = 1 \cdots n)$ = net cash flows per period,
n = project life (zero salvage assumed),

we have

$$C_0 = \sum_{t=1}^{n} F_t (1 + r)^{-t}. \qquad (1)$$

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The DCF rate, r, is uniquely determined by the configuration of net cash inflows per unit of outlay, where configuration, in this context, refers to the volume, time-pattern, and duration of the net cash inflows F_t.[6]

In the general case, where the configuration of F_t is freely variable, the rate r has to be ascertained by trial and error calculations from compound discount tables. However for a pattern of level cash inflows, equation (1) can be restated more explicitly. Thus if the net cash inflows is a level stream of F a year for n years, we have

$$F = C_0\left[\frac{r(1+r)^n}{(1+r)^n - 1}\right]. \tag{2}$$

Regular tables exist for the bracketed items for various values of r and n, and hence the value of r for any ratio F/C_0 can be found readily by inspection. For example, assume

$$C_0 = \$1{,}000,$$
$$F = 229.61,$$
$$n = 6.$$

Then using annual end-of-period discount tables it can be shown that $r = 0.10$ or 10 percent per annum.

Although the DCF rate for a single project is a well known and widely used measure in capital analysis, the corresponding DCF measure for an ongoing company is not generally available. The reason for this is that the pattern and duration of net cash flows for a single project is known or estimated, either retrospectively or prospectively, whereas this is not true for a company, which is an ongoing collection of many projects. However, logic tells us that if a company holds many projects, each of which individually yields a DCF rate r, then the company as a whole will also be generating a DCF rate r on its total portfolio. This is true regardless of the pace at which the projects have been acquired over time and regardless of the practices used in accounting for capital and income.

To compare the results obtained by measuring return on investment in terms of the book ratio b against the underlying DCF rate r, we must therefore use the simulated model in which r itself is known.

Company profitability: b vs r in the steady state

■ In order to analyze the level of b relative to any given level of r, we take a hypothetical company or companies which acquire or can acquire only a single type of investment whose cash inflow characteristics are known. For illustrative purposes we can take the investment mentioned above: $1,000 of outlay generates level cash inflows of $229.61 a year for 6 years, after which the asset is scrapped at zero salvage value. The DCF rate of return on this investment is 10 percent, and hence any company which holds a portfolio con-

[6] More specifically, the configuration of cash inflows per unit of outlay uniquely determines the rate r only if the outlay value is set independently of the rate, r. This is clearly true in the point-input case being discussed. It also holds for investment outlays which themselves have a time duration if the discounted present value of such outlays is calculated through the use of some cost of capital rate, k, which is known or assumed independently of the rate, r, expected from an individual project. However, the rate, r, is frequently (though incorrectly) calculated as that rate, r^*, that equates the present value of inflows with the present value of outlays when both inflows and outlays are discounted at a common rate, r^*. For this method of computation multiple solutions for r^* can exist. For a more complete discussion of multiple solutions, see [15], ch. 10.

sisting exclusively of such projects must be earning a DCF rate of 10 percent per annum.

What book rate b will such a company show? As we shall see, the answer to this depends on several factors. Two factors which have a powerful effect on the size of b relative to r deserve detailed consideration. These are:

1. Accounting practices used in defining book income and net book capital, and
2. The pace at which the company acquires new investments over time.

In order to understand the effect of each of these factors, we will deal with them one at a time. Assume, to begin with, that the company acquires new investments (or projects) by investing an equal amount of money each year. This will be referred to as the "steady-state" condition (it could equally well be called the zero-growth case). Our hypothetical company which invests an equal amount each year in the basic type of project outlined will reach a "steady state" after six years. Beyond this point it will always hold six "investments." When it acquires its seventh investment, the first one it acquired is scrapped, when it acquires the eighth the second is scrapped, and so on.[7]

The book rate of return b. The book rate of return for a company in the steady state, which holds only investments identical to the basic project outlined, will depend on the accounting procedures used—in particular, on the fraction of each original investment outlay which is expensed for book purposes, and the specific depreciation formula which is used in deriving income, period by period, over each project's economic lifetime.

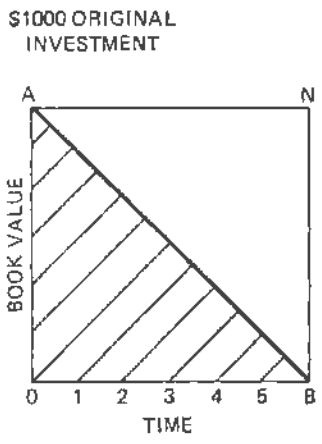
The book rate can be calculated by (1) defining the general value of b in algebraic terms and (2) solving such an equation for any given set of values of the accounting variables. However for any situation other than full capitalization of investment outlays and straight-line depreciation and zero growth, the algebraic expressions for the book rate of return can become exceedingly messy and sometimes complicated. Happily a graphical approach, even though partly intuitive, makes it possible to bypass explicit algebraic solutions and still make the relevant points.

To begin with the simplest situation, assume that the company capitalizes all of its investment outlays and uses a straight-line depreciation formula. The income statement of such a company after it reaches a steady state will show:

Net Cash Flow	$= 6 \times \$229.61$	$= \$1,377.66$
Depreciation	$= 6 \times 1/6 \times \$1,000$	$= \$1,000.00$
Net Book Income	$=$	$= \$ \ 377.66$

Its balance sheet, in the steady state, would show a net book value equal to one-half of the original outlay for the six "investments" it holds in its portfolio. This is shown in Figure 1. The original outlay is $1,000. This is written-off continuously as time passes, i.e., the net book value of each asset is diminished along the line AB. After $t = 6$ the company holds six vintages of investment ranging from one 0.5

FIGURE 1
STRAIGHT-LINE DEPRECIATION



[7] Inflation is assumed to be zero in this portion of the analysis.

year old to one 5.5 years old, and together they have an undepreciated net book value equal to the area under the line *AB*. We can see by inspection and our knowledge of Euclid that this is \$1,000 × 6/2 or \$3,000.

Thus the book rate of return for this company is \$377.66 ÷ \$3,000 or 12.6 percent.

We now also have a tool which permits us to vary our accounting procedures and to discover the consequent effect on *b* of doing so *without* engaging in tedious algebraic expressions. (Meanwhile we still retain our basic assumption that all companies are in a "steady state," i.e., that our company acquires its investments through *equal* annual outlays.)

Variation in expensing procedures

■ We can begin our analysis by assuming again that all companies acquire only the one basic investment we have outlined (\$1000 which generates \$229.61 a year for six years) and that all use straight-line depreciation. However, now they are free to alter their expensing procedures, i.e., they may charge off any fraction of the \$1000 as current expenses. (Recall that we are ignoring the tax-impact of expensing policies on net cash flows.)

As far as before-tax cash flows are concerned, there is no change if the company's accountant charges part of each year's \$1000 outlay to current expenses rather than to book capital. Therefore accounting procedures do not affect the DCF yield *r*. It remains at 10 percent on each investment held, and hence at 10 percent for all of them collectively.

Do these accounting variations in the fraction of each year's \$1000 outlay which is expensed affect the flow of company income? In the steady state (equal investment outlays each year) the answer is "No." This can be seen clearly in Table 1. Regardless of the amount expensed each year, the total annual charge of expensing plus depreciation adds up to \$1000.

What Table 1 shows is that (in the steady state) the flow of reported income (after depreciation of non-expensed capital and the expensed portion of current investment) does not vary at all with the expensing policy adopted.

Although expensing policy has no effect on book income (ignoring taxes) it does have a profound effect on the net book value of capital. Returning to Figure 1, we see that with a zero expensing policy the straight-line depreciation function (Line *AB*) produces a

TABLE 1

STRAIGHT-LINE DEPRECIATION

EXPENSING POLICY	ANNUAL CASH FLOW	ANNUAL AMOUNT EXPENSED	ANNUAL DEPRECIATION	ANNUAL BOOK INCOME
0	\$1377.66	\$ 0	\$1000	\$377.66
20%	1377.66	200	800	377.66
50%	1377.66	500	500	377.66
100%	1377.66	1000	0	377.66

company net book value of $3000, i.e., the net book value figure is equal to the area under the depreciation curve (or line).

With a 100-percent expensing policy, the depreciation function will follow the right-angled line *AOB*. The area under this curve is zero. Such a company would have no net book capital. But, as we have seen in Table 1, its net income is $377.66. Its book rate of return *b* will therefore be infinity. The corresponding net book value and book rate of return for different expensing policies (straight-line depreciation) are shown in Table 2.

TABLE 2

EXPENSING POLICY	ANNUAL BOOK INCOME	COMPANY NET BOOK VALUE	b (PERCENT)
0	$377.66	$3000	12.6
20%	377.66	2400	15.4
50%	377.66	1500	25.2
90%	377.66	300	125.9
100%	377.66	0	∞

The effects of expensing policies on book rates of return are clearly powerful. What this means is that two companies which are in fact generating the same DCF rate r might in theory show book rates b_a, b_b, b_c, $\cdots$ b_z which range all the way from less than r percent at one extreme to ∞ percent at the other. The empirical question is: Do companies or divisions of companies, in fact, use different expensing ratios as far as investment outlays are concerned. The answer is that they do. Many companies capitalize all or almost all of their investment outlays. Others expense a high fraction. Companies with high research and development expenditures use a high expensing policy. Companies with high long-range advertising expenditures (i.e., expenditures which contribute little to current period cash flow but which contribute to future cash flow) do in effect use a high expensing policy. Producing departments of petroleum companies or primarily producing companies in the oil and gas industry also expense a high fraction of outlays in the form of exploratory, developmental, and intangible drilling costs.

Because our model, thus far, is confined to steady-state situations (equal or approximately equal investment outlays each year) it is premature to extrapolate our findings to the real world, but the results are suggestive. For example, the producing segment of the integrated oil industry, or oil and gas companies which are primarily producers rather than refiners and transporters, tend to have significantly higher book rates of return than the integrated companies. For example, Amerada earned an average book rate on equity capital of 21.6 percent during the period 1964–1968 as opposed to a corresponding rate of about 12.0 percent for the integrated petroleum industry as a whole. Likewise, pharmaceutical companies and cosmetic companies (which also follow a higher-than-typical expensing policy with respect to investment outlays) consistently show significantly higher rates than the rest of the manufacturing sector.

For example, according to the Fortune Directory, the pharmaceutical industry has shown the highest return on invested capital year after year. For 1968 it was again in first place with a median book rate of return of 17.9 percent (compared to the *all*-industry median rate of 11.7 percent). The soaps and cosmetics industry was in second place with a median book rate of return of 16.9 percent.

The conventional explanation for these higher-than-normal rates of return for companies or industries is that they are either:

(1) riskier (this is the standard explanation for the producing sector of the oil and gas industry),

(2) more efficient, or

(3) have monopoly powers (this is frequently applied to the pharmaceutical sector).

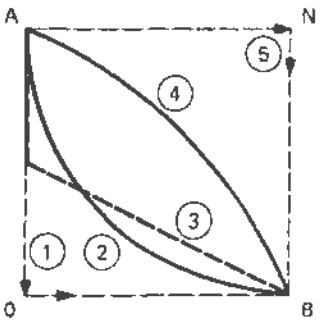
While these three conventional explanations may be correct in varying degrees, they all assume that the observable book rates accurately reflect commensurate DCF rates. The fact that many high-book-rate companies or industries also follow high "expensing" policies suggests strongly that a fourth potential explanation is too important to ignore: namely that the observable book rates significantly overstate the underlying DCF rates actually being earned.

Variations in depreciation methods

■ In addition to variations in accounting expensing policies, companies and industries use varying methods of depreciating the capitalized portion of their investment outlays. This is also a potential source of disturbance as far as the book rate of return is concerned. Since "depreciation" is a variant of "expensing" (which is instantaneous "depreciation") or vice-versa (depreciation is a form of "expensing" over time), we can deduce its effects without going through the mechanics of it in detail.

Depreciation, in itself, has no effect at all on before-tax net cash flows. Nor, in the steady state we are examining (equal annual investment outlays), does it affect net income flows. Any depreciation policy, like any expensing policy, or any combination of the two, must lead to a total annual charge equal to the annual outlay. In our arithmetic example this is $1000. In short, for any combination of depreciation policy or expensing policy, reported income in the steady state will be equal to $1377.66 less $1000, or $377.66.

FIGURE 2



But, like expensing policy, the depreciation policy employed has a profound effect on the amount of net book capital, because this is measured by the area under the expensing-depreciation function. Various functions are shown in Figure 2.

In theory, there are infinitely many ways to go from point *A* to point *B* without going out of the rectangle on Figure 2. The five ways shown are not meant to imply that these are the most usual forms—rather they represent potential variants in accounting policy. Each leads to a different estimate of net book value. Given our basic numerical example (that $1000 of outlay generates $229.61 of cash flow per year for six years), the level of net income for the company (assuming equal annual investment) is $377.66, but the level of net book value for the company will range from $0 for Policy No. 1 to $6000 for Policy No. 5. Thus the observable book rate of return will

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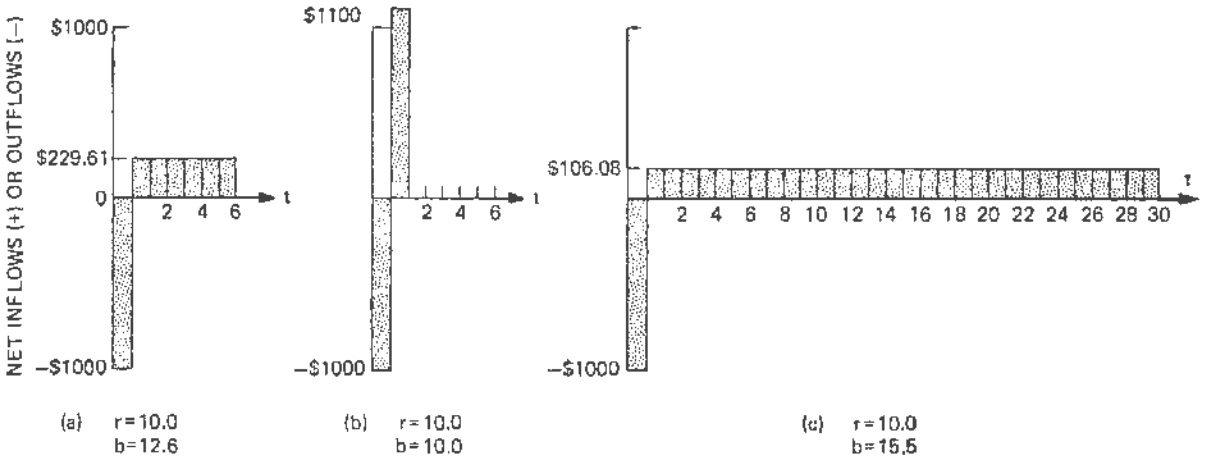
FIGURE 3



vary from a high of ∝ percent from Policy No. 1 to 6.3 percent for Policy No. 5. Together with expensing policy, depreciation policy produces wide variations in the observable book rate of return for any given DCF rate r (which in this example has been held fixed at 10.0 percent).

Other factors affecting the relation of b to r

■ Variations in accounting policies have a powerful effect on the size of rate of return measured in book rate units relative to the size of rate of return measured in DCF units. But they are not the only factors affecting the ($b \sim r$) relationship. Three other influences are:

1. The economic duration of each investment outlay,
2. The time lag between outlays on the one hand and the commencement of net cash inflows on the other,
3. The time pattern of net cash inflows after they commence.

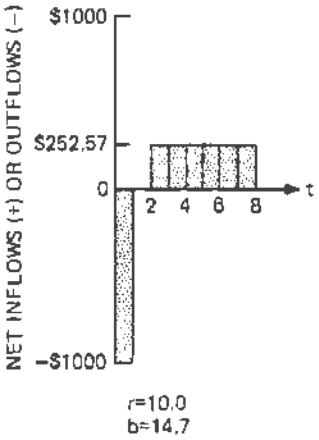
All three of these items can be summarized under a single caption—"The configuration of net cash outflows and inflows" from each investment.

□ *A.* Figure 3 shows three kinds of assets, all of which yield a DCF rate of 10 percent. Each of these shows outlays (below the horizontal line) and the size and duration of annual inflows (above the line). The first figure, 3a, is a depiction of the standard investment we have used for illustrative purposes thus far: $1000 buys $229.61 a year for 6 years. The DCF rate on this is 10 percent, but the book rate is 12.6 percent.

The second figure, 3b, is a short-duration investment in working capital. $1000 buys an inflow of $1100 in 1 year. The DCF rate (annual compounding basis) is 10 percent. So is the book rate. For this case $b = r$. And possibly this is how someone originated the idea that a rate could be measured accurately by taking the ratio of book income to book value of capital (or possibly it came from another favorite example in elementary commercial arithmetic—the case where $1000 produces a net inflow of $100 a year in perpetuity).

Finally the third figure, 3c, shows a long-duration investment, $1000 outlay producing a net cash inflow of $106.08 a year for 30

FIGURE 4



years. The DCF rate is still 10 percent. But the book rate for such a project, or for a "steady-state" company holding different vintages of such projects, would be 15.5 percent.

In short, in the steady state the longer the "duration" of each asset, the greater the discrepancy in the book rate unit measure relative to the DCF rate unit measure. Since, on working capital alone, the book rate is equal to the DCF rate, otherwise similar companies (with identical DCF rates) would show different book rates merely because each uses a different fraction of working capital relative to depreciable fixed capital.

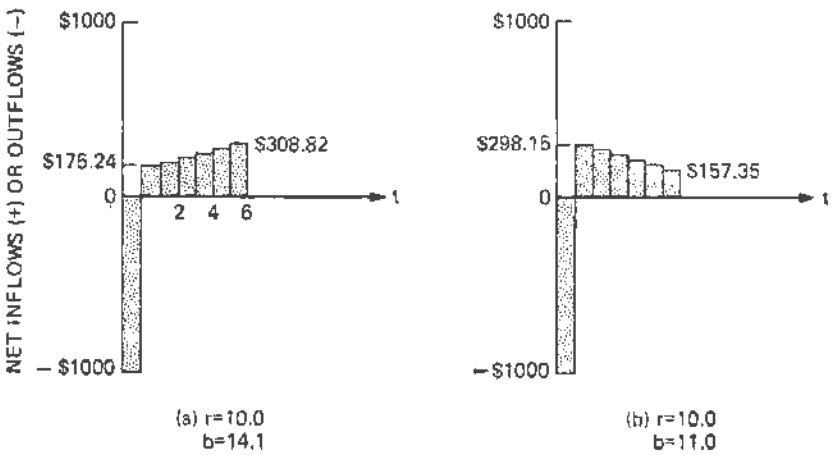
☐ *B.* Figure 4 illustrates the effect of time lags. Beginning with the original $1000 outlay which produces $229.61 a year for 6 years starting one year after the outlay is made, (which has a DCF rate of 10 percent and a book rate of 12.6 percent), this is altered in Figure 4 both to introduce a further one-year lag and to retain, in spite of this, a DCF rate of 10 percent per annum. The annual net cash inflow now has to be larger, $252.57 a year, to compensate for the one-year lag in initial receipts. In book rate units the rate of return will rise from 12.6 percent to 14.7 percent.

In the real world, different assets involve different lags. A truck can be productive the minute it is bought. A hydro-electric plant may take years to build, and many manufacturing plants take time to become fully productive even after they are built. The book rate measure will vary because of these differences.

☐ *C.* Figure 5 illustrates the effect of the time pattern of cash inflows. Even in the absence of inflation, all net inflows do not follow a level path over the assets' expected life. Some assets, especially those involving new products or processes, require time for full market penetration or de-bugging and are therefore likely to show rising net cash inflows. Others, especially new models of old products—like revised editions of automobiles, or college textbooks, or fashion products, or new detergents, or hula hoops—are likely to show a rapid "decay" pattern.

For any assumed DCF rate, the book rate will vary with the pattern. Thus the level pattern in Figure 3a shows a book rate of

FIGURE 5



12.6 percent as against the DCF rate of 10.0 percent. The rising pattern in Figure 5a, which starts at $175.24 per annum and rises at 12 percent a year to $308.82 in year 6, also has a DCF rate of 10 percent, but the book rate is 14.1 percent. Finally the "decay" pattern shown in Figure 5b starts at $298.15 in year 1 and "decays" at 12 percent per annum to $157.35 in year 6. The DCF yield is still 10 percent, but the book rate is 11 percent.

The effect of growth

■ We have shown that for a company in a steady-state situation (i.e., no growth) its book ratio or book rate of return is not an unbiased measure of the true DCF rate of return it is making. Instead we have:

$$b = f(r, x, d, n, w, l, \text{and } c)$$

which says that the company's observable book rate is a function of many things,

- r the DCF rate it is achieving
- x its average expensing policy
- d its depreciation policy
- n average productive life of assets
- w the fraction of working capital to total capital
- l the average time lag between the outlay for each asset and the commencement of net cash inflows from its use and
- c the time pattern of cash inflows.

In this section we lift the steady-state assumption to deal with another major factor which influences the level of the book rate for any given set of the variables outlined above: This is the pace at which the company invests over time. To keep the analysis straightforward we assume that these outlays increase (or decrease) steadily at a given rate g.[5]

If all of the assets it acquires generate a common DCF rate of return equal to r percent, then clearly a company will be earning a DCF rate of r percent regardless of its growth rate g.

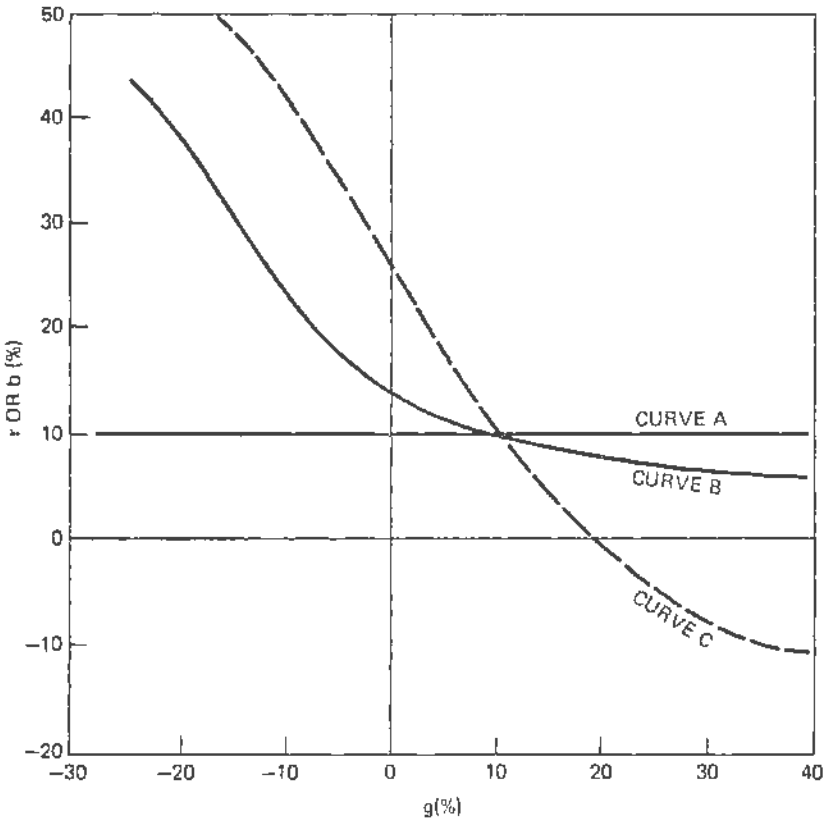
But unless the book rate b for such a company is equal to r in the steady state, variations in the pace of growth will cause changes in the observable book rate. The reason for this is simple and can be illustrated clearly in terms of our original "assumed" asset: namely the $1000 outlay which generates a level net cash flow of $229.61 for six years. Regardless of growth rate, a company holding only this form of asset holds six vintages of capital. In the steady state, the book rate earned on each vintage is a function of (a) the expensing and depreciation policy used and (b) the age of the vintage. With full capitalization and a straight-line depreciation policy, the net cash flow and net income attributable to each vintage is constant—at $229.61 *less* $166.66, or $62.95.

But the midyear net book value of each vintage shrinks with age from [$1000–83.33] for the latest vintage to [$1000–3(83.33)] for the vintage acquired the preceding year, down to $83.33 for the oldest producing asset.

Hence the book rates of return, by vintage, vary: Very low for the mostly undepreciated asset to very high for the almost fully de-

[5] Growth here is defined as real growth; i.e., inflation is still assumed to be zero.

FIGURE 6



preciated asset. The book rate for the company (earlier shown to be 12.6 percent) is simply a weighted average of the individual vintage book rates (with the net book values used as weights).

Introducing positive or negative growth into the analysis leaves the individual vintage book rates unaltered, but it changes the relative weights and, hence, the overall company rate (which is its weighted average). With positive growth, the "low yielding" newer vintages get a higher weight relative to the "high yielding" older vintages. Thus the company's overall book rate falls.

In contrast, when growth is negative (i.e., the company's new investment outlays shrink steadily over time), the opposite phenomenon occurs and the company's overall book rate rises.

The relationship of the book rate to the growth rate is shown in Figure 6. Curve A shows the company's DCF rate, i.e., 10 percent, which is of course invariant to the growth rate (since each asset held is earning 10 percent). Curve B shows what the company's book rate would be at various assumed rates of growth (positive and negative). As growth rates become very large the company's overall rate will be dominated by the newest "low yielding" vintage, i.e., curve *B* approaches the yield for the newest vintage. At very fast rates of decay (negative growth) curve *B* approaches the yield for the oldest vintage.

Curve *C* on the same chart shows the same company, but under the assumption that it expenses 50 percent of each investment outlay when the outlay is made and uses a straight-line depreciation policy for the remaining 50 percent. The individual vintage book rates will now be even further apart. The newest vintage, which has charges of

$500 of its acquistion price as an expense in its first year of life, will show a negative book rate of return, whereas the rate of return for the oldest vintage will now be more than twice as high as it was in the 100 percent capitalized situation. The effect of growth on curve C is therefore even more pronounced.

An interesting point on the growth axis is that at which the book rate b is exactly equal to the DCF rate r. This is the same for both curve B and curve C. And it will also hold for other curves D, $E \cdots Z$, which can be drawn for other combinations of the (x, d, n, w, l, and c) variables which affect the book rate of return. Why should this be so? A rigorous proof is beyond the scope of this paper, but one based on intuition runs as follows.

Taking very small intervals of time, we have by definition:

$$b_t = \frac{F_t - D_t}{B_t} \tag{3}$$

This says the book rate is equal to income (cash flow in period t less depreciation and expenses outlays in period t) divided by net book value. Also

$$g_t = \frac{I_t - D_t}{B_t}. \tag{4}$$

This says that the growth rate of investment (which is also the growth rate of net book value) is equal to the net additions to net book value (new investment outlay in period t less depreciation and expense outlays in period t) divided by the existing net book value.

Now the condition $g = r$ (the growth rate equal to the DCF rate) exists only when all of net cash flow generated is reinvested. (An easy way to see this is to think in terms of a barrel of wine increasing in value with age. The annual DCF rate of return on holding this barrel of wine is also the rate at which the barrel increases in value each year—but only if one does not drink part of the contents!) In short $b = r$ only if all the net cash flow is reinvested, i.e. only if $I_t = F_t$.

But if $I_t = F_t$ we can see from equations (3) and (4) above that the conditions $g = b$ must hold. Hence: If

$$g = r$$

we have

$$g = b$$

and thus

$$b = r.$$

In other words, the book rate is an unbiased and accurate measure of the DCF rate for a company which is growing steadily at a rate equal to r (or b).[9] This remarkable equality holds for all values of the extraneous variables x, d, n, w, l, and c.

Mixed assets, price-level changes and irregular growth

■ The introduction of steady real growth moves our explanatory model one step toward reality. The remaining steps would require the introduction and analysis of three other questions.

[9] The exact condition is that the company has been growing at this rate for at least n years, where n is the length of each underlying asset's productive life.

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1. What is the effect on the $b \sim r$ relationship of mixtures of different assets (and associated variables) within a single company?
2. What is the effect of regular and irregular changes in the price-level of inputs and outputs?
3. Finally, what is the effect of cyclical or other irregular growth rates in investment outlays?

The algebra can be stretched to incorporate some of these real-world variables, at least in simplified form, but the exercise gets increasingly tedious at a faster rate than the rewards in understanding grow. It is easier to jump directly to a fully simulated computerized model in order to explore the relationship of b to r under any assumed set of all these variables. But this is a task for a whole new paper. For the present, it is sufficient to suggest that the points we started out to make have been made:

1. The rate of return in conventional book rate units is conceptually and numerically different from the rate of return in DCF units.
2. Two companies with similar DCF rates of return may well show widely differing book rates of return.

Cost of capital counterparts to b and r

■ So far we have dealt with rates of return as measures of performance of real assets and the two basically different units in which these rates can be, and are, counted. The same holds true for the other facet: Rate of return as a measure of the "required," "fair," or "target" standard, also known as the "cost of capital." This facet too can be, and is, measured in terms of the two units of account, namely in DCF units or book rate units.

For example, the concept of the embedded cost of debt capital so widely used in utility regulation is a book rate measure. Likewise the "comparative earnings" approach to setting "fair rate of return" which uses book rate information as its basis, is also a book rate measure.

In contrast, there are other methodologies for "measuring the cost of capital" or setting financial standards for capital usage which are clearly DCF type rates. The most obvious example of such a rate is the yield to maturity of actual outstanding or comparably risky bonds. Another is the current dividend yield plus dividend growth rate formula for calculating the cost of equity funds. A less obvious member of the DCF family is the earnings/stock price ratio (commonly called the E/p ratio). This "looks" like a book rate but only because it is measured as a simple ratio. However, close examination shows that it is a short-cut (and frequently unreliable) procedure for measuring a DCF cost of capital rate. The argument in support of this conclusion is as follows. (a) The cost or price of equity capital in any capital market is the DCF rate at which investors discount (or capitalize) future expected benefits from owning equity securities in order to set a current market price for these securities. (b) For non-level projections of benefit streams, the investors' discount rate can be found only by a trial and error process. For dividend streams that grow continuously at a constant rate the mathematics of the process reduces to a fairly simple form, generally expressed as

$$k = \frac{D_0}{P_0} + g$$

where k is the DCF discount rate being solved for, D_0 is the current rate of dividends per share, P_0 is the current price per share, and g is the rate at which dividends are expected to grow.[10]

With even more restrictive assumptions about future investor expectations, the mathematics of finding the discount rate can be simplified even further. Thus, if future earnings (E) from existing assets can be assumed to be a level, perpetual stream, the present value equation linking current price to future benefits simplifies to[11]

$$k = \frac{E}{p}.$$

In short (quite apart from the validity of the almost impossibly restrictive assumptions underlying this formulation), the E/p basis for estimating k is simply a reduced form of the equation used in solving for a DCF rate.

Thus on the "financial standard" side we are faced with the same kind of confusion as we have on the "performance" side: There are two distinct and numerically different units, one a DCF unit usually symbolized as k, and one a book rate unit, which I will here symbolize as β. Both are called "cost of capital," and both use the label "percent per annum required rate of return."

Uses and misuses of disparate "rates"

■ The rules for the "correct" usage of these concepts and measures are fairly simple. If the actual or prospective performance of any investment is measured in DCF units, and if this rate is being assayed against some target or "reasonable rate standard," it is clear that the relevant standard must itself be calculated in DCF units. In short, r must be matched against k in order to produce rational decisions and judgments. Sometimes adjustments may be required, either to r or to k to allow for perceived differences in riskiness between the kind of investment being assayed and the kind of investments from which the k measure has been derived.

By the same token, if book rate units, b, are used to measure actual or prospective performance, the proper standard of comparison is against β. Here too risk adjustments are legitimate. In addition, adjustments may be necessary if the investment or collection of investments being assayed differ significantly with respect to the set of variables (x,d,u,w,l,c, and g) from the collection of investments from whose performance the estimate of β has been derived.

The potential misuses of these tools of thought involve all the inconsistent comparisons which can be made among the four measures. What is surprising is that almost every conceivable form of misuse is being practiced today. Some examples are:

1. A regulatory authority measures the cost of capital in DCF units (k) and then translates this number into "required revenues" by multiplying it against a net book value estimate (or one based on net book value).
2. The same authority measures the cost of equity capital (k_e) in DCF units and the cost of debt in book rate units (embedded cost), and uses the weighted average of these two rates as the figure to be multiplied against a net book value rate base.

[10] For a proof, see [5].
[11] For a proof, see [15], p. 25, note 7.

But regulation is not the only arena in which the disparate units are used as if they were interchangeable estimates of a common concept. Companies which have moved toward the measurement of investment worth in terms of a promised DCF rate still use book rates as a basis for setting the financial standard rate against which this promised DCF can be compared.

In some cases, DCF rates are used for *ex-ante* capital budgeting purposes, but an unadjusted book rate measure is used for later (*ex-post*) audit purposes, to check whether or not the investment lived up to its promise.

Finally, there is still a great deal of implicit acceptance that widely differing observed book rates are unbiased measures of actual profitability.

Understanding and avoiding these potential misuses of "rates of return" will not in itself provide correct answers. Important differential effects of price level changes on all measures, and the random effects of estimating errors, remain as significant barriers to be overcome, both for regulators and for private managers. Meanwhile, understanding that book rate measures and DCF rate measures are not different estimates of the *same* thing but rather estimates of *different* things should eliminate at least part of the confusion surrounding "rates of return on investment."

References

1. Bierman, H. "Depreciable Assets—Timing of Expense Recognition," *The Accounting Review*, October 1961, pp. 613–18.
2. Carlson, R. *Measuring Period Profitability*. Unpublished doctoral dissertation, Stanford University, 1967.
3. Cottle, S. and Whitman, W. *Corporate Earning Power and Market Valuation*. Durham, N. C.: Duke University Press, 1959.
4. Gordon, M. J. "The Payoff Period and the Rate of Profit," *The Management of Corporate Capital*, edited by Ezra Solomon. New York: MacMillan-Free Press, 1959, pp. 48–55.
5. ——— and Shapiro, E. "Capital Equipment Aanlysis: The Required Rate of Profit," *The Management of Corporate Capital*, edited by Ezra Solomon. New York: MacMillan-Free Press, 1959, pp. 141–47.
6. Harcourt, G. C. "The Accountant in a Golden Age," *Oxford Economic Papers*, New Series, Vol. 17, No. 1 (1965).
7. Johnson, O. "Two General Concepts of Depreciation," *Journal of Accounting Research*, Spring 1968, pp. 29–37.
8. Kuznets, S., ed. *Income and Wealth, Series II*. Cambridge: International Association for Research into Income and Wealth, Bowes-Bowes, 1952.
9. Lanzillotti, R. F. "Pricing Objectives in Large Companies," *American Economic Review*, Vol. 48 (1968), pp. 921–40.
10. Laya, J. C. *A Cash-Flow Model for Rate of Return*. Unpublished doctoral dissertation, Stanford University, 1965.
11. Minhas, B. S. *An International Comparison of Factor Costs and Factor Use*. Amsterdam: North Holland Publishing Company, 1963.
12. Solomon, E., ed. *The Management of Corporate Capital*. New York: MacMillan, 1959.
13. ———. "Research on Return on Investment: The Relation of Book-Yield to True Yield," in American Accounting Association. *Research in Accounting Measurement*, 1965.
14. ———. "Systematic Errors in Book Rates of Return," Society of Petroleum Engineers, SPE 655 (1963).
15. ———. *The Theory of Financial Management*. New York: Columbia University Press, 1963.

16. ———. "The Variation Between True Yield and Book Rate of Return in the Oil and Gas Producing Industry," Testimony before Federal Power Commission, Area Rate Proceedings AR-61-1 (1961).
17. ——— and LAYA, J. C. "Measurement of Company Profitability: Some Systematic Errors in the Accounting Rate of Return," in *Financial Research and its Implications for Management Decisions*, A. A. Robichek, ed. New York: John Wiley & Sons, 1966, pp. 152–183.
18. STIGLER, G. J. *Capital and Rates of Return in Manufacturing Industry*. Princeton, N. J.: Princeton University Press, 1963.
19. VATTER, W. J. "Income Models, Book Yield and the Rate of Return," *The Accounting Review*, October 1966, pp. 681–98.
20. WRIGHT, F. W. "Toward a General Theory of Depreciation," *Journal of Accounting Research*, Spring 1964, pp. 80–90.

On the Misuse of Accounting Rates of Return to Infer Monopoly Profits

By FRANKLIN M. FISHER AND JOHN J. MCGOWAN*

Accounting rates of return are frequently used as indices of monopoly power and market performance by economists and lawyers.[1] Such a procedure is valid only to the extent that profits are indeed monopoly profits, accounting profits are in fact economic profits, and the accounting rate of return equals the economic rate of return.

The large volume of research investigating the profits-concentration relationship uniformly relies on accounting rates of return, such as the ratio of reported profits to total assets or to stockholders' equity as the measure of profitability to be related to concentration.[2] Many users of accounting rates of return seem well aware that profits as reported by accountants may not be consistent from firm to firm or industry to industry and may not correspond to economists' definitions of profits. Likewise, they recognize that accountants' statements of assets, hence also stockholders' equity, may fail to correspond to economically acceptable definitions, because accounting practices do not provide for the capitalization of certain activities such as research and development and do not incorporate allowances for inflation. This is to say they are well aware of certain measurement problems which arise in using available accounting information to measure profitability. They seem, however, totally unaware of a much deeper conceptual problem, namely, that accounting rates of return, even if properly and consistently measured, provide almost no information about economic rates of return.[3]

The economic rate of return on an investment is, of course, that discount rate that equates the present value of its expected net revenue stream to its initial outlay. Putting aside the measurement problems referred to above, it is clear that it is the economic rate of return that is equalized within an industry in long-run industry competitive equilibrium and (after adjustment for risk) equalized everywhere in a competitive economy in long-run equilibrium. It is an economic rate of return (after risk adjustment) above the cost of capital that promotes expansion under competition and is produced by output restriction under monopoly. Thus, the economic rate of return is the only correct measure of the profit rate for purposes of economic analysis.[4] Accounting rates of return are useful only insofar as they yield information as to economic rates of return.[5]

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[1]Aside from *U.S. v. IBM*, see, for example, Joseph Cooper, p. 15; the various industry studies in Walter Adams; and the discussinn in Philip Areeda and Donald Turner, Vol. II, pp. 331–41.

[2]See the comprehensive reviews of this literature by Leonard Weiss and more recently by F. M. Scherer, pp. 267–95. Additional accounting problems raised by attempting to measure profitability by line of business are discussed extensively in George Benston.

[3]A referee suggests that even the crudest accounting information tells us IBM is more profitable than American Motors (AMC), but we disagree. Surely accounting information tells us IBM generates more dollars of profits per dollar of assets than does AMC but, as the examples below demonstrate, that information alone does not tell us which firm is more profitable in the sense of having a higher economic rate of return.

[4]This is literally true only if the cost of capital is first subtracted. In what follows below, we follow the usual empirical practice of measuring all rates of return before such subtraction.

[5]The existence of a uniquely defined economic rate of return—which we now assume for the theoretical analysis below and which occurs in all the examples—is

Now, it should be obvious that only by the merest happenstance will the accounting rate of return on a given investment, taken as the ratio of net revenue to book value in a particular year,[6] be equal to the economic rate of return that makes the present value of the entire net revenue stream equal to the initial capital cost. Indeed, as we shall see below, accounting rates of return on individual investments generally vary all over the lot. Hence, only if such fluctuations are somehow averaged out by a firm's investment behavior over time will its accounting rate of return even be roughly constant—let alone approximate the economic rate of return.[7]

It is easy to show that such averaging requires that the firm grow exponentially, investing in the same mix of investment types each year—an investment type being defined by a time shape of net revenues. Even in such an unrealistically favorable case, the accounting rate of return will generally depend on the rate of growth, equalling the economic rate of return only by accident. Furthermore, the relationship between the accounting and economic rates of return depends on the time shape of net revenues.

Hence, only by accident will accounting rates of return be in one-to-one correspondence with economic rates of return. We show by example below that the effects involved cannot be assumed to be small—indeed, they can be large enough to account for the entire interfirm variation in accounting rates of return among the largest firms in the United States.

The plan of the paper is as follows. Section I summarizes the theoretical results which are proved and elucidated in the Appendix. These results establish the relationships among the various rates of return, time shapes, and rates of growth, and demonstrate in principle that accounting rates of return are not informative. The balance of the paper analyzes a series of relatively simple examples to show that the theoretical effects are not so small that they can be neglected in practice. Indeed, they are very large. A ranking of firms by accounting rates of return can easily invert a ranking by economic rates of return.

Before proceeding, we note that some of the theoretical results given below are not new. Ezra Solomon wrote a number of articles culminating in one dealing with the case of exponential growth in 1970. Thomas Stauffer published various theorems a year later (1971) and also attempted to make adjustments to accounting rates of return to correct for alternative cash flow profiles in testimony for the FTC in the Ready to Eat Cereal Litigation.[8] J. Leslie Livingstone and Gerald Salamon (1971) have also studied and attempted to determine a relationship between the accounting and internal rates of return. Yet, perhaps because Solomon's focus was on the correct concepts of rate of return and cost of capital for rate regulation, or perhaps because none of the studies cited makes clear just how large the effects involved can be, the importance of these matters for more general industrial organization research appears to have gone largely unnoticed. It is our hope that the self-contained discussion of the present paper and, especially, the mag-

guaranteed only if the net revenue stream stemming from an investment has any negative terms occurring before the positive ones. If the economic rate of return fails to be unique, then, while present value calculations using the cost of capital remain the correct method for analyzing profitability, profitability cannot be summarized correctly by *any* rate of return, including accounting rates of return.

[6] Throughout this paper we work with accounting rates of return defined as ratios of profits to book values of capital. Similar (but not identical in detail) results apply to accounting rates of return on stockholders' equity. The precise relations involved can, in principle, be inferred from the results given below. (Such results do apply directly to accounting rates of return on stockholders' equity even in detail if we consider the firms being analyzed to hold neither debt nor retained earnings.)

[7] For discussion purposes—and in our examples below—we assume that the firm achieves the same economic rate of return on all its investments, and thus speak of "the" economic rate of return for the firm without worrying about differences between average and marginal rates. This is, of course, the most favorable case for the accounting rate of return for the firm as a whole

[8] The proofs given below are different from Stauffer's proofs, and, we think, more suitable for our present purposes than his where the propositions [illegible]

nitudes of the effects exhibited in the examples below will remedy this.

I. Summary of Theoretical Results

The main theoretical results, which are proved and elucidated in the Appendix, are as follows:

(a) Unless depreciation schedules are chosen in a particular way, so that the value of the investment is calculated as the present value at the economic rate of return of the stream of benefits remaining in it[9]—a choice which is exceptionally unlikely to be made—the accounting rate of return on a particular investment will differ from year to year, and will not in general equal the economic rate of return on that investment in any year.

(b) The accounting rate of return for the firm as a whole will be an average of the accounting rates of return for individual investments made in the past. The weights in that average will consist of the book value of those different investments which in turn depend on the depreciation schedule adopted, and, particularly, on the amount and timing of such investments.

(c) Unless the proportion of investments with a given time shape remains fixed every year, and unless the firm simply grows exponentially, increasing investments in each and every type of asset[10] by the same proportion for every year, the accounting rate of return to the firm as a whole cannot even be expected to be constant, let alone be equal to the economic rate of return.

(d) Even where the firm does operate in such an unrealistic manner—the case most favorable to the accounting rate of return—the accounting rate of return will vary with the rate of growth of the firm, and will not generally equal the economic rate of return.

(e) The only reliable inferences concerning the economic rate of return that can be drawn (and only in such an unrealistically favorable case) from examination of the accounting rate of return stem from the fact that the accounting rate of return and the economic rate of return will be on the same side of the firm's exponential growth rate. If the accounting rate of return is higher than the growth rate, then the economic rate of return is also higher than the growth rate. If the accounting rate of return is lower than the growth rate, then the economic rate of return is lower than the growth rate. If the accounting rate of return equals the growth rate, and in this case *alone*, the economic rate of return is guaranteed to be equal to the accounting rate of return.[11]

(f) Even in the unrealistically favorable exponential growth case, the accounting rate of return depends *crucially* on the time shape of benefits, and the effect of growth on the accounting rate of return also depends on that time shape. In particular, it is not true that rapidly growing firms tend to understate their profits and slowly growing firms tend to overstate them. The effect can go the other way.[12]

(g) All these results apply both to before- and after-tax rates of return.

II. The Likely Size of the Effects

We now show by example that differences between the accounting and economic rates of return can be quite large indeed. For the sake of economy we examine only differences in after-tax rates of return. We as-

[9] Such a "natural" depreciation formula—which we shall term "economic depreciation"—was first suggested by Harold Hotelling in 1925. It is somewhat misleading, however, to say that the fundamental conceptual problems discussed in the present paper are basically matters of depreciation accounting. Rather, there exists a particular form of depreciation which will correct those problems which stem from a fundamental difference between the economic and accounting rates of return. These problems arise even where machines never wear out. An example is given in Fisher (1979).

[10] Two assets are said to be of the same "type" if they yield the same time shape of benefits.

[11] It is worth pointing out that these results apply to accounting rates of return on total assets, not directly to accounting rates of return on stockholders' equity. Further, they apply to accounting rates of return on beginning-of-year, not end-of-year or yearly average assets. As the examples below show, the problem of making inferences from accounting rates of return on end-of-year (or average) assets is even worse—if possible—than when beginning-of-year assets are used.

[12] Compare Cooper, pp. 132–33.

TABLE 1—AFTER-TAX ACCOUNTING RATES OF RETURN[a]
(Percent for the *Q*-Profile; Six-Year Life; No Delay)

Year	Gross Profits (Cash Flow Before-Tax)	Depreciation	After-Tax Profits	Beginning-of-Year Assets		End-of-Year Assets	
				Net	Accounting Rate of Return	Net	Accounting Rate of Return
1	23.3	28.6	(5.3)	100.0	(5.3)	71.4	(7.4)
2	44.1	23.8	11.2	71.4	15.7	47.6	23.5
3	51.9	19.0	18.1	47.6	38.0	28.6	63.3
4	40.5	14.3	14.4	28.6	50.3	14.3	100.7
5	20.2	9.5	5.9	14.3	41.3	4.8	122.9
6	7.8	4.8	1.7	4.8	35.4	0	Infinite

[a]Tax rate: 45 percent; After-tax economic rate of return: 15 percent; Sum-of-the-years' digits depreciation.

sume a corporate tax rate of 45 percent, and (for most examples) fix the after-tax economic rate of return at 15 percent while varying growth rates and depreciation methods and the time shape of benefits.[13] Enormous variations in the accounting rates of return are readily generated.

A. *The "Q-Profile"*

We start with an investment whose benefits begin immediately and last for six years, and follow the time shape exhibited in column 2 of Table 1. For convenience we refer to this shape as the *Q*-profile.[14] The figures in column 2 are scaled to produce an after-tax economic rate of return of 15 percent on an initial investment of $100 when sum-of-the-years' digits depreciation over a six-year life is used. The remainder of the table shows the calculation of the corresponding accounting rate of return each year.

Plainly, the after-tax accounting rates of return vary substantially. They never equal the after-tax economic rate of return (15 percent), and exceed it in every year with positive net profits. Real-life firms do not generally exhibit such variation in their accounting rates of return because the averaging effects of growth, as it were, attribute profits from past investment to the book value of investments whose profit results are yet to come, rather than to the declining book value of such past investment.

While such an averaging effect tends to stabilize the accounting rate of return, it becomes a hodgepodge devoid of information about the economic rate of return. This point is illustrated by Table 2, which presents asymptotic accounting rates of return assuming constant exponential growth for three different versions of the *Q*-profile, each with the same tax rate (45 percent) and after-tax economic rate of return (15 percent).[15] The first version (the case of Table 1)

[13]Fifteen percent was roughly the average *accounting* rate of return in U.S. manufacturing corporations in 1978 (*Economic Report of the President*, 1979, pp. 279–91). If accounting and economic rates of return tended to coincide, 15 percent would be a reasonable choice for the economic rate of return. Since the rates do not generally coincide, the choice is immaterial. Choosing a lower economic rate of return would reduce the range of accounting rates of return in the results below (for the *same* examples), but would not affect the conclusions.

With a fixed capital investment, a given time shape of gross profits before depreciation and taxes results in different after-tax economic rates of return for different depreciation methods. To fix the after-tax economic rate of return for a given time shape, therefore, we adjust the height of the gross profit benefit stream proportionally to produce the desired after-tax economic rate of return.

[14]This shape was (erroneously) suggested during *U.S. v. IBM* as being typical of IBM's experience. We use it for convenience.

[15]In this context, exponential growth takes place by repeated investment in the same type of project; i.e., all investments have the same time-shape of benefits. This is obviously an unrealistic assumption, but one which is more likely to produce equality between accounting and economic rates of return than more realistic assumptions.

TABLE 2—ASYMPTOTIC ACCOUNTING RATES OF RETURN (%) ON THREE VERSIONS OF THE Q-PROFILE[a]

Growth Rate	Six-Year Life (No Delay)			Seven-Year Life (One-Year Delay)			Eight-Year Life (Two-Year Delay)		
	Straight Line	Declining Balance	Sum-of-Years' Digits	Straight Line	Declining Balance	Sum-of-Years' Digits	Straight Line	Declining Balance	Sum-of-Years' Digits
A. Beginning-of-Year Assets									
0	15.2	17.8	18.1	18.1	21.3	22.0	21.0	24.7	25.9
5	15.2	16.9	17.0	17.0	19.1	19.4	18.9	21.1	21.7
10	15.1	15.9	15.9	16.0	17.0	17.1	16.9	17.9	18.1
15	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
20	14.8	14.1	14.1	14.0	13.2	13.1	13.3	12.4	12.3
25	14.7	13.3	13.3	13.1	11.5	11.4	11.7	10.1	9.9
30	14.5	12.5	12.6	12.2	10.0	9.9	10.3	8.0	7.8
B. End-of-Year Assets									
0	15.2	17.8	18.1	18.1	21.3	22.0	21.0	24.7	25.9
5	14.5	16.1	16.2	16.2	18.1	18.5	18.0	20.1	20.7
10	13.7	14.5	14.5	14.6	15.4	15.5	15.3	16.3	16.5
15	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0
20	12.4	11.8	11.8	11.7	11.0	10.9	11.1	10.3	10.2
25	11.7	10.6	10.7	10.5	9.2	9.2	9.4	8.1	7.9
30	11.1	9.6	9.7	9.4	7.7	7.6	7.9	6.2	6.0

[a]See Table 1.

has no delay between investment and the beginning of the benefit stream, and depreciation is taken over the resulting six-year life. The second version has a seven-year life including a one-year's delay between investment and initial return. The third has an eight-year life including a two-year delay between investment and initial return. Except for the lag at the beginning and differences in scale, the gross benefit stream is the same in each case. Panel A of the table gives accounting rates of return on beginning-of-year assets; Panel B gives those on end-of-year assets.

Several things are apparent from Table 2. First, the accounting rates of return only equal the economic rate of return of 15 percent when the growth rate is also 15 percent and when the accounting rate of return is measured on beginning-of-year assets. Otherwise, the accounting rates vary from seven points below to almost eleven points above the economic rate of return.

Second, it is not true (as is sometimes stated) that more rapid depreciation, other things equal, tends to understate accounting rates of return. In this example, when the rate of growth is below 15 percent, declining balance and sum-of-the-years' digits depreciation produces a higher accounting rate of return than straightline depreciation for given growth rates, time profiles, and economic rates of return. The effect is reversed when the growth rate exceeds the economic rate of return of 15 percent. This illustrates a general proposition: more rapid depreciation *increases* the accounting rate of return (measured on beginning-of-year assets) when the growth is less than the economic rate of return, and *decreases* the accounting rate of return when the growth rate exceeds the economic rate of return.[16] Since this is the only point about depreciation which we wish to demonstrate, we provide only results for sum-of-the-years' digits depreciation in the rest of this paper.[17]

In all the examples in Table 2, firms growing at rates greater than the economic rate of

[16]By Theorem 1, the changeover point is also where the growth rate equals the accounting rate of return on beginning-of-year assets.

[17]There is one additional point about depreciation which we shall not bother to exemplify. Since the depreciation method chosen affects the time shape of the after-tax benefit stream, the relationship of after-tax accounting rates to the growth rate is particularly sensitive to the depreciation method. It can even happen that faster growth increases accounting rates of return for one choice of depreciation method and decreases them for another—all for the same pre-tax benefit time shape and the same after-tax economic rate of return. This makes adjustments for growth even harder to make than appears from the examples below.

TABLE 3—ASYMPTOTIC ACCOUNTING RATES OF RETURN (%) ON FOUR VERSIONS OF THE Q-PROFILE[a]

Growth Rate	Ten-Year Life (No Delay, Last Year Spread)	Six-Year Life (No Delay)	Seven-Year Life (One-Year Delay)	Eight-Year Life (Two-Year Delay)
A. Beginning-of-Year Assets				
0	13.9	18.1	22.0	25.9
5	14.5	17.0	19.4	21.7
10	14.8	15.9	17.1	18.1
15	15.0	15.0	15.0	15.0
20	15.1	14.1	13.1	12.3
25	15.1	13.3	11.4	9.9
30	15.0	12.6	9.9	7.8
B. End-of-Year Assets				
0	13.9	18.1	22.0	25.9
5	13.8	16.2	18.5	20.7
10	13.5	14.5	15.5	16.5
15	13.0	13.0	13.0	13.0
20	12.6	11.8	10.9	10.2
25	12.0	10.7	9.2	7.9
30	11.5	9.7	7.6	6.0

[a]See Table 1.

return of 15 percent have accounting rates of return on beginning-of-year assets less than the economic rate of return, while those growing at rates less than the economic rate of return all have accounting rates of return on beginning-of-year assets greater than the economic rate of return.[18] Contrary to what might be expected, this qualitative relationship provides no practical basis for adjusting accounting rates of return so that they will accurately reflect economic rates of return.

Table 2, for example, shows that firms which use sum-of-the-years' digits depreciation and grow at 5 percent have accounting rates of return on beginning-of-year assets which range from 17.0 to 21.7 percent. Thus, even for firms with the same growth rate and depreciation method, the required adjustment varies from 2 to 6.7 percentage points depending upon the time profile. Clearly, the time profile, depreciation method, and growth rate must all be known before accounting rates of return can be adjusted to reflect economic rates of return.

In the foregoing examples, for a given time shape, faster-growing firms have lower accounting rates of return than slower-growing ones with the same economic rate of return. We have seen that even if this were a universal phenomenon, it would not provide a way to adjust accounting rates of return to reflect economic rates of return, since different firms will generally have different time shapes and therefore require different adjustments. The difficulties are even worse in practice, because the accounting rate of return can actually *rise* with the growth rate, causing *slower*-growing firms to have their economic rates of return *under*stated. Thus, even the strong assumption that firms have the same time profile is insufficient to permit adjustment of accounting rates of return; the specific profile must also be known in order to make inferences about the ranking of economic rates of return.

We demonstrate this phenomenon by taking the original Q-profile (six-year life and no delay) and spreading the last year's gross profits out evenly over five years (years 6–10) instead of having them all in year 6. Table 3 shows that this small change in the profile produces an increasing relationship between the growth rate and the accounting rate of return. The original results for sum-of-the-year's digits depreciation are reproduced for ease of comparison.

[18]So simple a relationship does not hold if the accounting rate of return is based on end-of-year assets.

Focusing on the first column (10-Year Life), we see that the accounting rate of return on beginning-of-year assets actually begins by rising with the growth rate, reaching the value of the economic rate of return (as it must) at a 15 percent growth rate, and then going slightly above it before falling back again. (It is a special feature of this particular example that these values are all close to the economic rate of return of 15 percent.) The behavior of the accounting rate of return on end-of-year assets is different. This magnitude falls with the growth rate (in this example), but it exhibits still another phenomenon. As opposed to the previous example, where the accounting rates of return on both beginning- and end-of-year assets were above the economic rate of return of 15 percent for low growth rates and below it for large ones, here the accounting rate of return on end-of-year assets starts *and finishes* below the economic rate of return of 15 percent. There is *no* rate of growth for which the accounting rate of return on end-of-year assets equals the economic rate of 15 percent.

The impossibility of making inferences about relative profit rates should be obvious even within the confines of these examples, all of which represent only relatively slight variations on the same profile. *Every one of the firms exhibited in Table 3 has the same underlying after-tax economic rate of return. Yet their after-tax accounting rates of return on end-of-year assets vary from* 6.0 *to* 25.9 *percent.*[19]

Further, it is impossible to infer anything about relative profitability by attempting to adjust for growth rates. For example, each row of Table 3 involves firms with the same growth rate, so that there is nothing to adjust for in comparing them; yet, except for the special row corresponding to the point where the growth rate is equal to the true after-tax economic rate of return, the after-tax accounting rates of return continue to vary. For the row corresponding to 5 percent growth, for example, after-tax accounting rates of return vary between 13.8 and 20.7 percent. For the row corresponding to 25 percent, they vary between 7.9 and 12.0 percent. Further, it is not correct to say that slow-growing firms have accounting rates of return that overstate their economic rate, while fast-growing firms have accounting rates of return that understate them. Continuing to use accounting rates of return on end-of-year assets, the firm just introduced (10-Year Life) has an accounting rate of return which understates its economic rate of return at all levels of growth. If one uses beginning-of-year assets, it has accounting rates of return which tend to understate its economic rate of return at low rates of growth and (slightly) overstate it at higher ones.

TABLE 4—BEFORE-TAX BENEFIT STREAMS FROM AN INVESTMENT OF $100[a]

Year	*X* Firm ($)	*Y* Firm ($)
1	90.2	107.0
2	27.1	10.7
3	18.0	10.7
4	9.0	10.7
5	9.0	10.7
6	9.0	10.7

[a]See Table 1

Moreover, the phenomenon of accounting rates of return increasing with the growth rate can be considerably more marked if we use other profiles. Table 4 shows the before-tax benefit stream (corresponding to an initial investment of $100, an economic rate of return of 15 percent, and sum-of-the-years' digits depreciation over a six-year life) for two other profiles (*X* firm and *Y* firm). Table 5 shows the after-tax accounting rates of return for these firms when they grow exponentially at various rates. The after-tax accounting rates of return on beginning-of-year assets rise rather rapidly with the growth rate. The after-tax accounting rate of return on end-of-year assets also rises with the growth rate. However, as was also the case for the variation on the *Q*-profile examined earlier, it does not rise by enough to get to the economic rate of return of 15 percent.

[19]Here and later, the results for beginning-of-year assets are similar.

TABLE 5—ASYMPTOTIC ACCOUNTING RATES OF RETURN (%) FOR X-FIRMS AND Y-FIRMS[a]

Growth Rate	Beginning-of-Year Assets		End-of-Year Assets	
	X Firm	Y Firm	X Firm	Y Firm
0	12.9	12.5	12.9	12.5
5	13.6	13.3	13.0	12.7
10	14.3	14.2	13.0	12.9
15	15.0	15.0	13.0	13.0
20	15.7	15.8	13.0	13.2
25	16.3	16.6	13.0	13.3
30	16.9	17.3	13.0	13.3

[a]See Table 1.

III. Conclusions

That the accounting rate of return—after tax as well as before tax—is a misleading measure of the economic rate of return is evident from examining cases of single projects such as in Table 1. The cases shown in later tables are unduly *favorable* to the accounting rate of return in that they mask its behavior by averaging. That averaging effect is achieved by the quite unrealistic assumption that investment by the firm always brings in the same time shape of returns, and that the firm grows each year by increasing its investments at the same percentage rate. Even on such favorable terms, it is impossible to infer either the magnitude or direction of differences in economic rates of return from differences in accounting rates of return. This is because such inferences require not only correction for growth rates, but *also* knowledge of the time shapes of returns.

The level and behavior of the accounting rate of return are both sensitive to the type of time shape used. Even within the *Q*-profile example, the rates vary depending on when the time shape begins and how the last few years are spread out. There is every reason to suppose that firms differ in the time shapes of their investments, and that a particular firm's investments will also differ among themselves. Thus, comparisons of accounting rates of return to make inferences about monopoly profits is a baseless procedure.

This conclusion can be most dramatically demonstrated by juxtaposing accounting rates of return for firms with different time shapes and *different* economic rates of return. When this is done, it is easy to see that firms with *higher* accounting rates of return can have *lower* economic rates of return. Table 6 gives after-tax economic rates of return and after-tax accounting rates of return on end-of-year assets for three growth rates (0, 5, and 10 percent), and for each of the six time shapes already discussed as well as two other "one-hoss shay" time shapes.[20] For *each* growth rate, the examples are chosen so that the eight firms represented are ranked in *ascending* order of economic rates of return and in *descending* order of accounting rates of return—a complete reversal even with growth rates constant.

Examination of Table 6 shows again that no inference about relative after-tax economic rates of return is possible from after-tax accounting rates of return. For example, the lowest after-tax economic rate of return in the table is that for the *Q*-profile with an eight-year life at a zero growth rate. For that firm, the after-tax economic rate of return is 13 percent. Yet, its after-tax accounting rate

[20]The one-hoss shay time shapes have a constant return (no lag) for four and six years, respectively, and zero returns thereafter.

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TABLE 6—AFTER-TAX ECONOMIC RATES OF RETURN (E) AND ASYMPTOTIC ACCOUNTING RATES OF RETURN ON END-OF-YEAR ASSETS (A) FOR EIGHT TIME SHAPES[a]

	Growth Rate					
	0 Percent		5 Percent		10 Percent	
Growth Rate	E	A	E	A	E	A
Q-Profile						
8-Year Life (2-year delay)	13.0	21.6	16.0	22.6	17.8	21.2
7-Year Life (1-year delay)	14.0	20.2	17.0	21.6	18.8	20.9
One-Hoss Shay						
6-Year Life (no delay)	15.0	20.0	18.1	21.4	19.7	20.7
4-Year Life (no delay)	16.0	19.8	19.0	21.3	20.0	20.289
Q-Profile						
6-Year Life (no delay)	16.1	19.6	19.05	21.2	20.05	20.287
10-Year Life (no delay; last year spread)	18.0	16.9	20.0	18.5	22.0	19.8
X Firm	19.0	16.2	21.0	17.8	23.0	19.2
Y Firm	19.2	15.8	21.2	17.4	23.2	18.9

[a] Tax rate: 45 percent; Sum-of-the-years' digits depreciation.

of return on end-of-year assets is 21.6 percent, the second *highest* accounting rate of return in the table, and a value well above that of 15.8 percent for the Y firm at zero growth, corresponding to a 19.2 percent economic rate of return. The 21.6 percent accounting rate of return so encountered is even above the 18.9 percent figure obtained for the Y firm at 10 percent growth—a figure which corresponds to an economic rate of return of 23.2 percent, the highest in the table, and more than 10 percentage points above the economic rate of return of 13 percent for the Q-profile with an eight-year life at zero growth. Similar examples of reversals occur throughout the table.

Nor can one eliminate these effects by correcting somehow for differences in rates of growth. The table as constructed exhibits a reversal of the ordering of economic and accounting rates of return with the rate of growth held constant. Rate of growth effects have thus *already* been removed from each pair of columns to an extent beyond that which one could hope to achieve in practice. Moreover, it is not true that faster-growing firms should have their accounting rates of return adjusted upwards relative to slower growing ones. Consider the comparison between the Q-profile with a ten-year life at zero growth and the Q-profile with an eight-year life at 5 percent growth. The faster-growing firm has an accounting rate of return (22.6 percent) already greater than that of the slower-growing firm (16.9 percent), but its economic rate of return (16.0 percent) is *below* that of the slower-growing firm (18.0 percent). Adjusting the faster-growing firm's accounting rate of return *upwards* relative to that of the slower-growing one will make things *worse*, not better.

As all of this makes clear, there is no way in which one can look at accounting rates of return and infer anything about relative economic profitability or, a fortiori, about the presence or absence of monopoly profits. The economic rate of return is difficult—perhaps impossible—to compute for entire firms. Doing so requires information about both the past and the future which

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outside observers do not have, if it exists at all.[21] Yet it is the economic rate of return which is the magnitude of interest for economic propositions. Economists (and others) who believe that analysis of accounting rates of return will tell them much (if they can only overcome the various definitional problems which separate economists and accountants) are deluding themselves. The literature which supposedly relates concentration and economic profit rates does no such thing, and examination of absolute or relative accounting rates of return to draw conclusions about monopoly profits is a totally misleading enterprise.

APPENDIX
I: BEFORE-TAX ANALYSIS

A. *The Accounting Rate of Return on Individual Investments*

We begin our analysis of the problem by considering the before-tax accounting and economic rates of return on a single investment. Later we shall consider the firm as being made up of a series of such investments which may be (but need not always be) of the same type. The after-tax case is treated below and shown to be isomorphic, although more complex.

An investment may be thought of for heuristic purposes as a "machine" costing one dollar. If this is invested at time 0, the firm experiences a stream of net benefits as a result. Such benefits include all changes in revenues and costs (other than the initial capital cost) which accrue to the firm as a result of making the investment. The flow of such benefits at time θ is denoted by $f(\theta)$.[22]

[21] If one made the strong assumption that the same time shape of returns held for all investments made by a given firm throughout its life, then it might be possible to recover that time shape by regression of gross returns on a distributed lag of past investment. We are indebted to Zvi Griliches for this suggestion.

[22] The time origin is arbitrary. The flow of benefits is assumed to depend on the age of the machine only. Thus an investment at time t brings in benefits of $f(\theta - t)$ at time $\theta \geq t$. Time dependence of the benefit stream can be handled below by thinking of it as equivalent to investment in different kinds of machines at different times.

The economic rate of return on a machine, r, is that discount rate which makes the discounted value of the benefit stream equal to the capital costs of the investment. In other words, r satisfies

$$\text{(A1)} \qquad \int_0^\infty f(\theta)\exp(-r\theta)\,d\theta = 1.$$

We assume that the integral in (A1) is monotonically decreasing in r so that (A1) has a unique positive solution. This will be true if the negative portion of the net benefit stream (if any) precedes the positive portion. This is the usual case.[23]

Now the firm adopts a depreciation schedule for this machine. Let $V(\theta)$ denote the book value of the machine as of time θ. Then $-V'(\theta)$ is the rate of depreciation at θ, where the prime denotes differentiation. Plainly, $V(0) = 1$, and it makes sense to suppose that $V(\infty) = 0$, although this latter condition is not really needed.

Accounting profits attributable to this machine at time θ will be equal to net benefits less depreciation. We can think of the accounting rate of return for this machine as the accounting rate of return which the firm would have if this were its only asset. Denoting that rate by $b(\theta)$,

$$\text{(A2)} \quad b(\theta) = (f(\theta) + V'(\theta))/V(\theta).$$

The first question which comes immediately to mind is that of when $b(\theta) = r$ for all θ within the life of the machine. We prove this will occur if and only if the depreciation schedule adopted by the firm always values the machine as the discounted value of the future benefit stream, discounting at the economic rate of return, r (see Hotelling).

THEOREM 1: *$b(\theta) \equiv r$ if and only if*

$$\text{(A3)} \quad V(\theta) = \int_\theta^\infty f(u)\exp(-r(u-\theta))\,du.$$

[23] If (A1) has more than one solution, then the economic rate of return is ill-defined and there is even less point in considering whether the accounting rate of return yields information about it.

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PROOF:

(a) Suppose (A3) holds. Differentiating with respect to θ, we obtain

$$V'(\theta) = -f(\theta) + rV(\theta), \tag{A4}$$

which when substituted in equation (A2) yields $b(\theta) = r$.

(b) Suppose $b(\theta) \equiv r$. Then, from (A2),

$$V'(\theta) \equiv rV(\theta) - f(\theta). \tag{A5}$$

This is a linear differential equation with an additive forcing function $(-f(\theta))$. Its solution is therefore in the form

$$V(\theta) = C\exp(r\theta) + z(\theta), \tag{A6}$$

where $z(\theta)$ is any particular solution of (A5) and C is a constant to be determined by the initial conditions. However, by part (a) of the proof, the integral on the right-hand side of (A3) is a particular solution of (A5). Hence $z(\theta)$ can be taken as that integral. Do this and note that $z(0) = 1$ by (A1), the definition of the economic rate of return. Since we have $V(0) = 1$, setting $\theta = 0$ in (A6) yields $C = 0$, and the theorem is proved.

Thus even where the firm has a single simple investment with no ambiguity about marginal vs. economic rates of return, the accounting rate of return will not equal the economic rate of return except for a particular choice of a depreciation schedule—which choice we may term "economic depreciation."

The reason for this is not hard to find. The book value of the firm's assets reflects the investment expenditures made in the past less the depreciation already taken on them. The benefits for which such investments were made are at least partly in the future. Yet the accounting rate of return takes gross profits before depreciation as the benefit flow which happens to be currently occurring. Unless depreciation is chosen so as to reflect the change in *future* benefits in the appropriate way, there is no reason to suppose that such a calculation should equal the economic rate of return, and Theorem 1 shows that the two will generally not be equal.

Will firms tend to adopt an "economic depreciation" schedule yielding book value as in equation (A3)? This is pathologically unlikely. Except in the simple "Santa Claus" case of $f(\theta) = k\exp(-\lambda\theta)$ which corresponds to exponential depreciation or other similarly special cases corresponding to straightline or other standard depreciation methods, the benefit stream from investment when plugged into (A3) will not yield depreciation schedules anything like those used by real-life firms to optimize after-tax profits given IRS rules or those schedules used for nontax purposes. Real investments will almost invariably have complicated time shapes for their benefit streams. Further, even relatively simple shapes yield economic depreciation schedules which are quite far from actual ones. To see this, one need only observe that if $V(\theta)$ satisfies equation (A3), there is no reason that $V'(\theta)$ must always be negative. Indeed, if the time stream of benefits starts low and then has a hump a few years out, taking economic depreciation would require writing up the value of assets for the first few years. Yet there is nothing bizarre about such an example.

We must, therefore, with pathologically unlikely exceptions, expect that the accounting rate of return on a particular machine, $a(\theta)$, will generally not equal the economic rate of return r. (How far off it can be is demonstrated by examples.) This should make us suspect that the same thing will generally be true of the firm as a whole, and we now go on to explore that question.

B. *The Accounting Rate of Return for the Firm as an Average*

It is fairly plain that the best hope for an accounting rate of return equal to the economic rate of return will occur if all investments made by the firm are exactly alike, since otherwise (as shown below), changes in the mix of investment types will change the accounting rate. So we begin by considering the case in which all machines are like the machine above.

It now becomes necessary to distinguish calendar time, denoted by t, from the age of a machine, denoted by θ. We let $I(t)$ be the

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value of investment made at t (equals the number of machines purchased). Let $K(t)$ denote the book value of the firm's assets at t and $\pi(t)$ the value of its accounting profits at t. Then,

$$\text{(A7)} \quad K(t) = \int_{-\infty}^{t} I(u)V(t-u)\,du = \int_{0}^{\infty} I(t-\theta)V(\theta)\,d\theta,$$

where $\theta = t - u$. Similarly,

$$\text{(A8)} \quad \pi(t) = \int_{-\infty}^{t} I(u)\{f(t-u)+V'(t-u)\}\,du = \int_{0}^{\infty} I(t-\theta)\{f(\theta)+V'(\theta)\}\,d\theta = \int_{0}^{\infty} I(t-\theta)V(\theta)b(\theta)\,d\theta,$$

using (A2).

Hence, letting $a(t)$ be the firm's accounting rate of return at t:

$$\text{(A9)} \quad a(t) \equiv \pi(t)/K(t) = \left[\int_0^\infty \{I(t-\theta)V(\theta)\}b(\theta)\,d\theta\right] / \left[\int_0^\infty \{I(t-\theta)V(\theta)\}d\theta\right];$$

so that we have proved

LEMMA 1: *At any time t, the accounting rate of return for the firm as a whole is a weighted average of the individual accounting rates for its individual past investments, the weights being the book values of those past investments.*

It should be obvious that this result would also be true if machines were not always of one type.

We now ask whether such an average will equal the economic rate of return. First consider whether the average can even be independent of t. This can happen in two ways. First, $b(\theta)$ might be independent of θ. We know from Theorem 1 that this will happen for $b(\theta) \equiv r$ only for the cases of economic depreciation already discussed which we rule out. It is easy to show that $b(\theta) \equiv q \neq r$ is impossible.[24]

The other way in which $a(t)$ might be independent of t would be if the relative weights in the average did not change over time.[25]

$$\text{(A10)} \quad \frac{I(t_1-\theta)V(\theta)}{I(t_2-\theta)V(\theta)} = k,$$

whence

$$\text{(A11)} \quad \frac{I'(t_1-\theta)}{I(t_1-\theta)} = \frac{I'(t_2-\theta)}{I(t_2-\theta)},$$

for all (t_1, t_2). Evidently it must then be the case that

$$\text{(A12)} \quad I(t) = M\exp(gt)$$

for some constant growth rate g.

The remainder of our investigation will concern the case of exponential growth with the scale factor, M, set equal to unity. This case is the most favorable to accounting rates of return approximating economic rates of return, since in its absence accounting rates of return will not even be constant, even though the economic rate of return is well defined and constant.

C. *The Effect of the Growth Rate in Exponential Growth*

We are now dealing with a case in which the accounting rate of return is (at least

[24] To see this, observe that a proof essentially the same as that of Theorem 1 would show that $b(\theta) \equiv q$ if and only if

(a) $$V(\theta) = C\exp(q\theta) + z(\theta),$$

where

(b) $$z(\theta) = \int_0^\infty f(u)\exp(-q(u-\theta))\,du,$$

but $V(0) = 1$ so that $C = 1 - z(0) \neq 0$ if $q \neq r$. Then (A4) yields $V(\infty) = \pm\infty$ depending on $q \gtrless r$ and this is not possible.

[25] For a *given* distribution of $b(\theta)$ there might be other possibilities, but these would be even more special than the case of economic depreciation already discussed. The statement in the text is true if $a(t)$ is to be constant despite unknown variations in $b(\theta)$ with θ.

asymptotically) constant and given as

$$(A13)\quad a=\frac{\int_0^\infty\{exp(g(t-\theta))V(\theta)\}b(\theta)\,d\theta}{\int_0^\infty\{exp(g(t-\theta))V(\theta)\}\,d\theta}$$

where a denotes the (asymptotic) constant value. This is still a weighted average of the accounting rates of return on individual investments. Plainly, the growth rate g affects the weights. Since the accounting rates of return on individual investments will almost always not be constant in view of Theorem 1, changes in the weights will usually affect the average.

The present section studies such effects and asks, in particular, what inferences can be drawn concerning the economic rate of return r, from knowledge of the accounting rate of return a, and the growth rate g, without information on the time shape of benefits, $f(\cdot)$, since the latter information is plainly never available from the books of the firm—even assuming it is known in detail to the firm's forecasters.

The first thing to say in this regard is that while (as we shall show) there exist values of g for which $a=r$, these values will be the exception. One cannot expect accounting and economic rates of return to coincide even in the most favorable case of exponential growth and a single investment type except by the merest accident. What information *can* be gleaned from the accounting rate of return is analyzed in this section.

It will be convenient to set up the problem a little differently from the analyses above. Let $\pi^*(t)$ denote the gross profits of the firm before depreciation. Let $\delta(t)$ denote total depreciation taken at time t. Let $K^*(t)$ denote the *undepreciated* value of the firm's capital stock. Let $D(t)$ denote the total depreciation already taken on that stock. Finally, let $a^*=\pi^*(t)/K^*(t)$, so that a^* is the accounting rate of return which would be observed if there were no depreciation. The following relationships hold:

$$(A14)\qquad a=\frac{\pi^*(t)-\delta(t)}{K^*(t)-D(t)},$$

$$(A15)\quad \pi^*(t)\equiv\int_{-\infty}^{t}exp(gu)f(t-u)\,du$$

$$=\int_0^\infty exp(g(t-\theta))f(\theta)\,d\theta$$

$$=exp(gt)\int_0^\infty exp(-g\theta)f(\theta)\,d\theta$$

$$=exp(gt)\pi^*(0),$$

$$(A16)\quad K^*(t)\equiv\int_{-\infty}^{t}exp(gu)\,du$$

$$=exp(gt)/g$$

$$(A17)\quad \delta(t)=\int_{-\infty}^{t}exp(gu)V'(t-u)\,du$$

$$=\int_0^\infty exp(g(t-\theta))V'(\theta)\,d\theta$$

$$=exp(gt)\delta(0),$$

$$(A18)\quad D(t)=\int_{-\infty}^{t}\delta(u)\,du$$

$$=\int_{-\infty}^{t}exp(gu)\delta(0)\,du$$

$$=\delta(0)exp(gt)/g.$$

Evidently, we have proved:

LEMMA 2: $\delta(t)/D(t)=g$.

We now study the effects of g on a^*.

LEMMA 3: (a) *If* $g=r$, *then* $a^*=r=g$.
(b) $d\log a^*/d\log g<1$.
(c) a^* *and* r *are always on the same side of* g. *That is*, $a^*<g\leftrightarrow r<g$; $a^*=g\leftrightarrow r=g$; $a^*>g\leftrightarrow r>g$.

PROOF:
(a) Using equations (A15) and (A16),

$$(A19)\quad a^*=g\pi^*(0)$$

$$\equiv g\int_0^\infty exp(-g\theta)f(\theta)\,d\theta.$$

If $g = r$, then $\pi^*(0) = 1$ by the definition of the economic rate of return (A1), whence $a^* = g = r$.

(b) From (A19),

$$\log a^* = \log g + \log \pi^*(0), \tag{A20}$$

but examination of $\pi^*(0)$ shows that it is necessarily decreasing in g since it is the discounted integral of future benefits from a single machine discounted at the rate g. Thus $d \log a^* / d \log g < 1$.

(c) These statements follow directly from (a) and (b).

Using Lemmas 2 and 3, we can now proceed to the main result of this section for the magnitude of interest, the accounting rate of return a, itself.

THEOREM 2: *a and r are always on the same side of g. That is,*

$$a < g \leftrightarrow r < g; \qquad a = g \leftrightarrow r = g;$$

$$a > g \leftrightarrow r > g.$$

PROOF:

By definition, $\pi^*(t) = a^* K^*(t)$. By Lemma 2, $\delta(t) = gD(t)$. Substituting in (A14)

$$a = \frac{a^* K^*(t) - gD(t)}{K^*(t) - D(t)} \gtreqless g, \tag{A21}$$

accordingly as $a^* \gtreqless g$. The desired result now follows from Lemma 3.

A diagram may be illuminating here. In Figure 1, the growth rate is measured on the horizontal axis and rates of return on the vertical axis. The 45° line indicates where growth rates and rates of return are equal. Theorem 2 states that the accounting rate of return must be above the 45° line to the left of the dashed line at $g = r$; it must pass through H, the point of intersection of the dashed line and the 45° line; and it must be below the 45° line to the right of the dashed line.

Can we say more than this? The answer is in the negative without information on the time shape of benefits $f(\cdot)$. In particular, it is

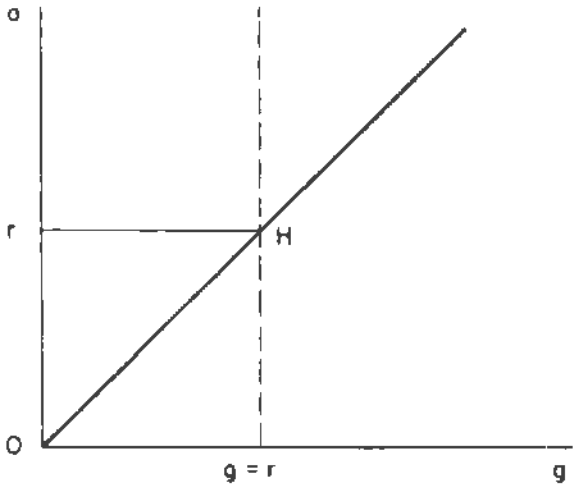

FIGURE 1

not the case that the direction of change of a with respect to g is signed. Nor is it true that r must lie between a and g. These facts are exemplified in the text.

II. After-Tax Analysis

These same results apply to the analysis of the relationship between the after-tax economic rate of return and the after-tax accounting rate of return. This is obvious if the depreciation schedule used is not that used for tax purposes; in that case, the effect of taxes is just to change the benefit profile with the analysis the same as before, given the new benefit profile $f(\cdot)$. Moreover, the same thing is true if tax depreciation is used. To see this, let α be the tax rate $0 < \alpha < 1$ (assumed constant for simplicity). Let r' denote the after-tax economic rate of return. Then r' satisfies

$$\int_0^\infty \{(1-\alpha) f(\theta) + \alpha d(\theta)\} \times \exp(-r'\theta)\, d\theta = 1, \tag{A22}$$

where $d(\theta)$ denotes depreciation on an asset of age θ and $f(\theta)$ denotes its *before*-tax benefits, as before.

This reflects the fact that the choice of a depreciation schedule, $d(\cdot)$, affects after-tax

returns. Define

$$(A23) \quad f^*(\theta) \equiv \langle (1-\alpha) f(\theta) + \alpha d(\theta) \rangle.$$

We now show that the analysis of the before-tax case applies directly to the after-tax case with $f^*(\cdot)$, the after-tax benefit schedule, replacing $f(\cdot)$, the before-tax benefit schedule.[26]

To see this, observe that the denominator of the accounting rate-of-return (whether total capitalization or stockholder's equity) will be the same before and after taxes. The numerator in the after-tax case, after-tax profits less depreciation, will be:

(A24)

$$\int_{-\infty}^{t} (1-\alpha)\{f(t-\theta) - d(t-\theta)\} I(\theta)\, d\theta,$$

$$= \int_{-\infty}^{t} \{(1-\alpha) f(t-\theta) + \alpha d(t-\theta)\} I(\theta)\, d\theta$$

$$- \int_{-\infty}^{t} d(t-\theta) I(\theta)\, d\theta,$$

$$= \int_{\infty}^{t} f^*(t-\theta) I(\theta)\, d\theta - \int_{-\infty}^{t} d(\theta) I(\theta)\, d\theta.$$

But this is the *same* numerator as would be encountered in the before-tax analysis for a firm with the same depreciation schedule, but *before*-tax benefits $f^*(\cdot)$. For such a firm, r' would be the before-tax economic rate of return. Hence analysis of the after-tax case is identical to that of the before-tax case with an appropriate adjusted definition of the benefit schedule. All previous results apply to it.[27]

[26]A word about the treatment of inflation seems appropriate here. In the before-tax analysis it does not matter whether we work in real or nominal dollars (so long as we are consistent). In the after-tax case, however, the fact that depreciation which is deductible for tax purposes must be in nominal terms appears to raise some difficulty. That difficulty is only apparent however. Suppose that we begin by working in real terms. The nominal nature of the depreciation deduction plus the effects of inflation affect the depreciation schedule measured in real terms. We show, however, that any after-tax case with *any* depreciation schedule is isomorphic to a before-tax case. The effects being considered will, of course, influence *what* that before-tax case is, but they will not alter the existence of such a case. Hence, while the nominal nature of depreciation (like any other factor affecting the depreciation schedule) will affect what the numerical value of the real after-tax accounting rate of return is, it will not change our results.

[27]It is interesting (and revealing of the full unity of the before- and after-tax analyses) to note what happens in the case of "economic depreciation" examined above. In that case, it turns out that the (pathologically unlikely) choice of an economic depreciation schedule involves the *same* depreciation schedule whether economic depreciation is chosen before or after tax. Assets are valued at the present value of all remaining benefits either before or after tax; it makes no difference. Further, that choice of depreciation schedule makes the after-tax economic rate of return r' relate to the before-tax economic rate of return r, in the natural (bnt—except with this depreciation schedule—not inevitable) way: $r' = r(1-\alpha)$. To show these things, return to the differential equation (equation (A5)) from which we derived the formula for economic depreciation in the before-tax case.

$$(a) \qquad V'(\theta) = rV(\theta) - f(\theta).$$

Consideration of the before-tax analysis shows that if and only if $V(\cdot)$ satisfies this and $V(0) = 1$, then

$$(b) \qquad V(\theta) = \int_{\theta}^{\infty} f(u) \exp(-r(u-\theta))\, du$$

the present value of future benefits. Now, choose $V(\cdot)$ and hence $d(\cdot)$ to satisfy (b) and therefore (a). Then

$$(c) \quad (1-\alpha)V'(\theta) = r(1-\alpha)V(\theta) - (1-\alpha)f(\theta),$$

$$(d) \quad V'(\theta) = r(1-\alpha)V(\theta)$$

$$- \{(1-\alpha)f(\theta) + \alpha d(\theta)\} = r(1-\alpha)V(\theta) - f^*(\theta),$$

since $d(\theta) \equiv -V'(\theta)$. But this is in the same form as (a). Hence, as in (A6):

$$(e) \qquad V(\theta) = \int_{\theta}^{\infty} f^*(u) \exp(-r'(u-\theta))\, du + C \exp(r'\theta),$$

with $r' \equiv r(1-\alpha)$. Here, C is a constant of integration; however $C = 0$, since (b) shows that $V(\infty)$ is finite. Since $V(0) = 1$, we have

$$(f) \qquad 1 = \int_{0}^{\infty} f^*(u) \exp(-r'u)\, du,$$

which shows that r' is the after-tax economic rate of return. From (b) and (c) with $C = 0$, $V(\theta)$ is both the before- and the after-tax present value of the remaining benefit stream at θ, whence economic depreciation is the same in both cases. See Paul Samuelson.

Thus, in after-tax analysis as in before-tax analysis, there is no reason to believe that differences in the accounting rate of return correspond to differences in economic rates of return. Our computer examples show the effects can be very large; the belief that they are small enough in practice to make accounting rates useful for analytic purposes rests on nothing but wishful thinking.

REFERENCES

Adams, Walter, *The Structure of American Industry*, New York: Macmillan, 1970.

Areeda, Philip and Turner, Donald F., *Antitrust Law: An Analysis of Antitrust Principles and Their Application*, Boston: Little, Brown and Co., 1978.

Benston, George J., "The FTC's Line of Business Program: A Benefit-Cost Analysis," in Harvey Goldschmid, ed., *Business Disclosure: Government's Need to Know*, New York: McGraw-Hill, 1979, 58–118.

Cooper, Joseph D., *Proceedings of the Second Seminar on Economics of Pharmaceutical Innovation*, Washington: American University, 1976.

Fisher, Franklin M., "Diagnosing Monopoly," *Quarterly Review of Economics and Business*, Summer 1979, *19*, 7–33.

Hotelling, Harold, "A General Mathematical Theory of Depreciation," *Journal of the American Statistical Association*, September 1925, *20*, 340–53.

Livingstone, J. Leslie and Salamon, Gerald L., "Relationship Between the Accounting and the Internal Rate of Return Measures: A Synthesis and Analysis," in J. Leslie Livingstone and Thomas J. Burns, eds., *Income Theory and Rate of Return*, Columbus: Ohio State University, 1971, 161–78.

Samuelson, Paul A., "Tax Deductibility of Economic Depreciation to Insure Investment Valuations," *Journal of Political Economy*, December 1964, *72*, 604–06.

Scherer, F. M., *Industrial Market Structure and Economic Performance*, Chicago: Rand McNally, 1980.

Solomon, Ezra, "Alternative Rate of Return Concepts and Their Implications for Utility Regulation," *Bell Journal of Economics*, Spring 1970, *1*, 65–81.

Stauffer, Thomas R., "The Measurement of Corporate Rates of Return: A Generalized Formulation," *Bell Journal of Economics*, Autumn 1971, *2*, 434–69.

Weiss, Leonard W., "The Concentration-Profits Relationship and Antitrust," in Harvey J. Goldschmid et al., *Industrial Concentration: The New Learning*, Boston, Little, Brown and Co., 1974.

U.S. Council of Economic Advisers, *Economic Report of the President*, Washington: USGPO, 1979.

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The application of finance theory to public utility rate cases

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The purpose of this paper is to formulate the implications of finance theory for rate of return regulation. A variety of problems in finance and the law and economics of regulation are reviewed. Also, a regulatory procedure based on finance theory is proposed for practical use.

Finance theory suggests that the "comparable earnings" standard for rate of return regulation ought to be based on utilities' costs of capital. The cost of capital is difficult to measure, since it is defined in terms of investors' expectations. But plausible estimates can be obtained for utilities. The following principle is proposed for use of these estimates: Regulation should assure that the average expected rate of return on desired new utility investment is equal to the cost of capital. This is a definition of "fair return" based on the theory of competitive equilibrium. The principle is consistent with the comparable earnings standard. Only the most obvious, "straightforward" approach to implementing this principle is examined in detail; but this approach is practical and logically sound. It is particularly attractive when combined with conscious use of regulatory lag as an instrument of regulation. There are some difficulties, however, when such a lag is combined with the usual regulatory practice of basing the allowed rate of return on embedded rather than current debt costs.

The problem of determining the appropriate rate base is also discussed. Regulation based on the book value rate base will not generally lead to efficient price, output, or investment decisions. A "competitive market value" rate base would be better from the standpoint of efficiency, since it would lead to long-run marginal cost pricing. However, long-run marginal cost pricing is not generally consistent with the principle that utilities ought to be able to expect to earn their cost of capital on new investment.

1. Introduction

■ There is little argument in practical circles about the broad purpose of regulating public utilities' rates of return. The accepted legal

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principle is that "the return to the equity owner should be commensurate with returns on investments in other enterprises having corresponding risks," and sufficient to "attract capital" and maintain credit worthiness.[1]

Finance (the study of investments, capital markets, and financial management) seems directly relevant to the regulatory agencies' attempt to determine the rate of return allowed by law. Although relevant, the applications of finance theory in the regulatory field are not easily seen or understood.

The difficulties involved in transferring finance theory to regulatory problems are attested to by the sharp controversies generated by economists who have ventured into rate proceedings. Disagreements have arisen not only between economists and the usual participants in these proceedings but also among the economists themselves. Thus the problem is not simply *explaining* the theory to the regulators; it has not been clear how the theory should be applied.

The purpose of this paper is to formulate the implications of finance theory for public utility regulation. It is an attempt to apply theory to practical affairs. Thus, detailed attention is given not only to the theory per se but to current regulatory procedures, to alternative procedures, and to the controversies associated with recent attempts to apply finance theory in the regulatory arena.

A few caveats are necessary at the start:

(1) The paper's title means just what it says. This is not a general treatment of finance theory or of public utility rate regulation, but of the application of the former in the latter field. The various aspects of finance and regulation are pursued only as far as is necessary for this limited purpose. For example, I treat the practical problems of estimating utilities' costs of capital only superficially, concentrating instead on how an estimated cost of capital should be used. The problem of estimation is at least as hard and important as that of application, but it is substantially the same problem faced by nonregulated firms. Reviewing it in detail would mean reviewing much of finance theory in detail—a task I cannot attempt here.
(2) I will concentrate on one possible method of regulation, namely control of the overall rate of return earned. For the most part, I am taking the existing legal and procedural framework as given. I do not mean to imply that this framework is necessarily the best one.
(3) The paper does not necessarily describe how regulators actually behave, but how they should behave if the legal and procedural framework is taken at face value and the implications of finance and economic theory are recognized. One suspects that various nonfinancial considerations also affect regulatory behavior, and that regulators respond to objectives that are not evident in the legal and procedural framework.[2]

In short, I do not propose to present an optimal regulatory strategy or a complete positive theory of regulatory behavior. The

[1] This is from the Supreme Court Decision on Federal Power Commission et al. v. Hope Natural Gas Company, 320 U. S. 591 (1949) at 603.

[2] For example, see Posner [38] and Stigler [48] for substantially different views of the role of regulation.

objective is to provide an analysis which can be used to improve existing procedures. This is a limited, but important, objective. Existing procedures not only involve Big Money, but they apparently influence the allocation of resources to, and within, a substantial segment of the economy.

The paper begins with a brief review of the mechanics of rate of return regulation and describes the traditional interpretation of the accepted legal standards for a "fair" rate of return. I argue that the traditional interpretation has serious deficiencies, both in logic and in application. A market-based cost of capital is suggested as an alternative basis for establishing a "fair" return.

The middle portion of the paper (Sections 3 through 5) discusses the definition and measurement of the cost of capital, under the simplifying assumption that the firm is all-equity financed. A number of controversies involving definition and measurement for a regulated firm are discussed.

Measuring the cost of capital is one question, using it another. Sections 6 and 7 summarize the aims of regulation and show that these aims cannot be achieved solely by regulating overall rate of return. However, a somewhat limited objective is logical and feasible; that is, regulation should insure that the expected rate of return on desired new investment is equal to the cost of capital. I present an approach to regulation which is consistent with this principle and discuss the real and alleged problems in implementing it.

The penultimate section drops the assumption of all-equity financing, briefly discusses the problem of determining optimal capital structure, and shows how the approach developed in Sections 6 and 7 can be applied to utilities with complicated capital structures.

The last section includes a brief summary of major conclusions.

2. Review of rate regulation

■ **Regulatory procedures.** A utility's prices are set so that the utility covers its costs, including taxes and depreciation, plus a certain return on investment. The return on investment is obtained by multiplying the "rate base" by an allowed rate of return. The rate base is essentially the book value of the utility's capital investment.[3]

For example, suppose Utility X has a rate base of $100 million. It is producing one billion widgets per year. The allowed rate of return is set at 10 percent overall. Costs are $50 million per year, including depreciation and all taxes.[4] Then the average price of widgets is set as follows:[5]

$$\text{Price per widget} = \frac{\text{Revenue requirements}}{\text{No. of widgets}} = \frac{50{,}000{,}000 + 0.10(100{,}000{,}000)}{10^9} = \$0.06\,.$$

Thus widgets are sold for $0.06 until the next regulatory proceeding. This procedure allows the actual return earned to be more or less than

[3] Sometimes "fair value" rate bases are used. They are discussed later in this paper.

[4] That is, costs would be adjusted to cover income taxes associated with a 10-percent return, as well as property taxes, social security contributions, etc.

[5] This paper is concerned with the *level*, not the structure, of utility rates.

TABLE 1

PACIFIC GAS TRANSMISSION CO.–ALLOWED OVERALL RATE OF RETURN

CAPITAL SOURCE	PERCENT OF CAPITALIZATION	RATE OF RETURN IN PERCENT	WEIGHTED RATE
DEBT	79.66	6.13	4.88
EQUITY	20.34	11.64	2.37
TOTAL	100.00		7.25

SOURCE: FPC OPINION NO. 569 [58], P. 15.

10 percent, depending on realized cost and revenues during the period of "regulatory lag" between proceedings.

The allowable rate of return is computed in the same fashion as a weighted average cost of capital, but with important differences. Table 1 shows the computation of the overall rate of return allowed Pacific Gas Transmission Company in a 1970 Federal Power Commission decision. The procedure for computing the overall return, 7.25 percent, is clear from the table, but the table does not show where such numbers typically come from.

(1) The figures listed under "percent of capitalization" refer to the respective percentages of debt and equity listed on the company's books at the time of the rate proceeding. They are book, not market, values. Neither do they necessarily refer to the proportions of debt and equity to be employed in future financing.

(2) The 6.13-percent figure is the "embedded" debt cost—that is, total interest payments divided by the book value of outstanding debt. The company's current borrowing rate can be much higher or lower than the "embedded" debt cost shown.

(3) The percentage cost of equity is a figure arrived at by judgment. I discuss the possible bases for this judgment below.

Although there are opportunities for disagreement at each of these three steps, most argument is centered on the return to equity, so I will start there.

□ **The legal standard for setting the return to equity.** The governing principle is the Supreme Court's statement in the Hope decision:

> 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.[6]

The first sentence establishes a standard of "comparable earnings," the second, a standard of "capital attraction." The broad language of the Hope decision allows a variety of specific interpretations of these standards.

It is best to start with the comparable earnings standard. In practice, it has been applied in two ways. The traditional and most widely accepted approach[7] defines "returns" as the book rates of

[6] Note 1 *supra.*

[7] The most complete exposition and defense of this method is Leventhal [22].

return of other firms.[8] Those who advocate the traditional approach read the Hope decision in a particular way, namely:

> The return to the equity owner should be commensurate with [*recent book*] returns on [*past*] investments [*made by*] other enterprises having corresponding risks.

This approach rests on a special notion of opportunity cost—in this context, that a utility should be allowed to earn what it *would have* earned had its capital been invested in other firms of comparable risk.[9]

The alternative suggested by finance theory is to define "commensurate return" as the rate of return investors anticipate when they purchase equity shares of comparable risk. This is a *market* rate of return, defined in terms of anticipated dividends and capital gains relative to stock prices.

□ **Drawbacks of the traditional interpretation.** The traditional interpretation has clear deficiencies. First, the method does not rest easily on the concept of opportunity cost. Opportunity cost is a marginal and forward-looking concept. Thus, the opportunity cost of investing in a particular asset is usually defined as the anticipated rate of return on an incremental investment in the best alternative. However, observed book rates of return are average returns on past investments.

Granted, average and marginal returns are equal at long-run equilibrium in perfectly competitive markets; but this is in an *ex ante* sense. No one argues that perfect competition requires equality of rates of return after the fact in an uncertain world. In any case, usually no attempt is made in regulatory proceedings to see whether the data examined really are marginal rates of return and whether they stem from perfectly competitive situations.

Second, the traditional interpretation of comparable earnings ignores capital markets. This is serious because the Supreme Court specifies that the variable of interest is "the return to the equity owner." The shareholder is not directly interested in the ratio of book earnings to the book value of a company he invests in. He looks at anticipated dividends and capital gains relative to the stock price he has to pay. Thus, it is more relevant to interpret the opportunity cost of capital as the return on securities with risks similar to the stock of the utility in question.

A third objection is that it is difficult, in practice, to find a suitable class of firms with corresponding risks. Suppose you are looking for a company with risk commensurate with Utility X. The likeliest

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[8] I will use the term "book" to refer to data based on income statements and balance sheets. Thus, the book rate of return to equity is simply the ratio of reported income to net worth as shown on the firm's balance sheet.

[9] The reader may wish to judge for himself whether this characterization of the "traditional interpretation" is accurate. I would suggest starting with two intelligently done examples of this approach. See testimony of Solomon [60] and Friend [37]. Friend concludes: "If regulation is attempting to duplicate competitive results, the rate of return permitted on AT&T equity should be of the same general order of magnitude as on industrials and electric utilities with the same [risk] characteristics. This would require a return in the neighborhood of 12% to be consistent with [book] returns achieved in the last decade by electric companies and even somewhat higher to be consistent with the return achieved by comparable industrials" (p. 17).

candidates are other utilities, whose reported book rates of return reflect past regulatory decisions as well as competitive forces. Basing current regulatory decisions partly on past decisions leads to a dangerously arbitrary standard. One is forced to look elsewhere, to unregulated firms. But such firms presumably are riskier than utilities. Moreover, there is no clear theory about how risk should be related to differences in book rates of return (or even how risk should be defined if the book rate of return is the variable of interest.) In contrast, the relationship of risk and return in capital markets is better understood. This is discussed later in the paper.

The final objection is that accounting rates of return are subject to serious measurement errors and biases, particularly when comparisons are made between firms in different industries. This is also discussed later in the paper.

To summarize, the difficulties with the traditional interpretation of the comparable earnings standard are at very least sufficient to justify examination of alternatives.

3. Finance theory and the cost of capital concept

■ If a utility's allowed rate of return is to be "sufficient . . . to attract capital" and "commensurate with returns on investments in other enterprises having corresponding risks," then it has something in common with the cost of capital as that concept is used in finance. But "the cost of capital" is one of those phrases that can mean a dozen things. Thus, it will be helpful to review the concept briefly.

□ **Definitions and assumptions.** To simplify matters, we will concentrate for the moment on a firm that is all-equity financed and can ignore market imperfections such as transaction costs and taxes. The logic in developing a cost of capital (i.e., minimum acceptable expected rate of return, or "hurdle rate") for such a firm's investments goes as follows:

(1) The firm is one of a class with similar risk characteristics—call this class j.

(2) At any point in time there is a unique expected rate of return prevailing in capital markets for this degree of risk—call it R_j.

(3) The share price of the firm in question will adjust so that it offers an expected rate of return R_j to investors.

(4) This rate, the shareholders' opportunity cost, should be the minimum acceptable expected rate of return on new investment, assuming the projects under consideration have risk characteristics similar to currently held assets. Otherwise, the firm's shareholders' wealth will not be maximized.

This sequence of logic defines the appropriate discount rate for projects which do not change the firm's risk characteristics. The basic problem is one of estimating the rates prevailing in the market.

The following equilibrium condition will be assumed to define R_j:

$$P_{tj} = \frac{D_{t+1,j} + P_{t+1,j}}{1 + R_j}, \qquad (1)$$

where

P_{tj} = ex-dividend price at the end of period t;
$D_{t+1,j}$ = dividends[10] expected to be received in $t + 1$, and
$P_{t+1,j}$ = expected ex-dividend price at the end of $t + 1$.

It is not literally true that everyone has the same expectations of future returns. However, for purposes of analysis I assume that it is permissible to speak of "the market's" expectations.

Also, note that if R_j is assumed constant over time,[11] equation (1) implies

$$P_{0j} = \sum_{t=1}^{\infty} \frac{D_{tj}}{(1 + R_j)^t}. \tag{2}$$

□ **Additional comments.**

Risk classes

The phrase "risk class" does not strictly imply that risk can be measured in one dimension. Moreover, it is conceivable that equilibrium expected rates of return on securities depend not only on risk but on still other factors, although this has not been established.

Nevertheless, the concept of opportunity cost (relative to an equivalent class of securities) is not made invalid by the fact that it may have to be defined as a function of several variables.[12] It is true, of course, that the more complicated the function, the more difficult is use of the concept.

Evaluating investments in differing risk classes

Most of the analysis in this paper assumes that the firm's risk class is given. However, what happens if it is not?

Suppose the firm acquires or disposes of an asset or liability, and that the transaction changes the firm's risk class from j to w. Assume that the asset or liability considered separately is in class k. Then in perfect markets,

$$P_{wt} = \bar{P}_t + \Delta P_t = \frac{\bar{D}_{t+1} + \bar{P}_{t+1}}{1 + R_j} + \frac{\Delta D_{t+1} + \Delta P_{t+1}}{1 + R_k}, \tag{3}$$

where $^-$ indicates initial values and Δ, changes due to adoption of the

[10] "Dividends" must be broadly interpreted to include all cash flows from the firm to holders of the share in question. Conceivably, D_t might include return of capital or even direct repurchase of shares by the firm.

[11] This assumption avoids consideration of the term "structure of interest rates." It also assumes that the perceived risk of successive future dividends increases at a constant rate as a function of t. See Robichek and Myers [40].

[12] For example, the different tax treatment of capital gains vs. dividends implies, *ceteris paribus*, that equilibrium expected rates of return should be positively correlated with dividend yield. If so, this would add another dimension necessary to define a class of equivalent securities. However, it is not clear whether there is any systematic empirical relationship between dividend yield or payout and equilibrium rates of return. See, for example, Friend and Puckett [15], Miller and Modigliani [30], especially p. 370, and Black and Scholes [6]. Others, notably Gordon, have argued that equilibrium rates of return are negatively related to dividend payout. See [16], for example.

project in class k.[13] Alternatively,

$$\Delta P_t = \sum_{t=1}^{\infty} \frac{\Delta D_t}{(1 + R_k)^t}, \tag{4}$$

where ΔD_t is the expected incremental cash flow from adoption of the project. Thus, if the asset or liability under consideration has risk characteristics like securities in class k, then the appropriate opportunity cost is R_k, the equilibrium rate of return offered by class k securities.

4. Estimating the cost of capital

■ This paper does not go very deeply into the problem of estimating investors' opportunity costs. However, a brief review will be helpful in two ways. First, it will show the kinds of evidence likely to be relied on in a practical context. Second, it will show some of the implications of the view of security valuation presented in Section 3 above.

The basic proposition underlying the cost of capital concept is that at any point in time securities are so priced that all securities of equivalent risk (i.e., all securities in a "risk class") offer the same expected rate of return. For a given utility the basic problem is to determine the expected rate of return for the class in which the stock falls.

There is no mechanical way to do this. Measurement of expectations is intrinsically difficult. But there are several types of evidence that should be examined before the ultimate judgment is made.

1. Interest rates

Interest rates on corporate bonds and other debt instruments can be readily observed to provide a floor for the estimate. Changes in the basic level of interest rates normally correspond in direction to changes in the cost of equity capital.

2. Ex post rates of return to investors

Averaging of *ex post* rates of return (or better, of *ex post* risk premiums, since interest rates vary over time) give some indication of the relevant range in which expectations lie. These averages are most helpful to the extent that they cover a long period of time and many stocks.[14] One cannot very well rely on five years of history for the utility in question as a guide to investors' expectations for the future.

3. DCF formulas

Examination of interest rates and past rates of return indicates a range for expected rates of return on common stocks. But these measures give insufficient bases for estimating a particular firm's cost of equity capital.

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[13] The theorem is proved in a more general form in Myers [36]. There are, of course, degrees of perfection, and there is a residual disagreement about how perfect markets have to be in order for equations (3) and (4) to hold. See Lintner [23], p. 108, and on the other hand, Hamada [19].

[14] There is plenty of evidence available. See, for instance, Fisher and Lorie [13].

One approach is the so-called DCF or discounted cash flow method.[15] Its basic premise is equation (2)—i.e., that stock price is the present value, discounted at R, of the stream of expected dividends.[16] The idea is to infer R from the observed price P_0 and an estimate of what investors expect in the way of future dividends.

In practice a number of simplifications of equation (2) are employed in using the DCF method. Suppose, for example, that the dividend stream is expected to grow indefinitely at some rate g which is less than R. Then equation (1) can be simplified to

$$P_0 = \frac{D_1}{R - g}, \tag{5}$$

$$R = \frac{D_1}{P_0} + g. \tag{5a}$$

For utilities, for which a constant, moderate long-term trend in earnings and dividends is often identifiable, equation (5a) can be a reasonable rule of thumb for estimating R. A danger is that temporary growth trends are apt to be mechanically projected "to infinity." Likewise, it is tempting to assume without checking that expected future growth is constant. Fortunately, there is nothing in equation (2) that requires a single, perpetual growth rate. One can easily assume that different growth rates are anticipated for different future periods.[17]

In general, the DCF model—either equation (5a) or some more complicated variant of equation (2)—has to be fit to the case at hand. The point of the analysis is to answer the question, What would a rational unbiased investor expect from a long-term investment in this stock at the prevailing price? This rate of return is taken to be R on the assumption that the prevailing price is based on the opportunity cost of investment in equivalent-risk securities.

4. Earnings-price ratios

Earnings-price ratios can be used to measure the cost of equity capital in some cases. The formulas

$$P_0 = \frac{\text{EPS}_1}{R}, \tag{6}$$

$$R = \frac{\text{EPS}_1}{P_0} \tag{6a}$$

are actually special cases of equation (2) if certain assumptions hold.

Suppose that earnings per share (EPS) in any one year are "normal" long-run earnings of the firm's business and that all earn-

[15] For examples of the use of the method, see testimony of Brigham [55], Kosh [52], Myers [53, 61], and Roseman [57].

[16] The subscript j has been dropped because the firm's risk class is taken as given.

[17] In [61] I used a simple structural model of the firm to project the dividend stream under different assumptions about the short-term growth, long-term growth, and year-by-year book profitability. The dividend stream and the final estimate of the cost of equity capital were based on these simulations.

ings are paid out as dividends. Then equations (6) and (6a) are simply equations (5) and (5a) but with $g=0$.

Thus it is said that EPS_1/P_0 measures the cost of equity capital for "no-growth" firms. This is possibly misleading, however. Suppose a firm which falls initially into the no-growth category instead reinvests a portion of its earnings in projects which have on the average a present value of exactly zero. Then announcement of these projects makes the firm no more nor less attractive to investors, even though the firm will expand because of the reinvested earnings. The firm's current stock price will not change. Therefore, R is still correctly measured by EPS_1/P_0.

If the projects are on the average more than marginally desirable, however, the price will rise, earnings per share will remain constant, and thus the earnings-price ratio will underestimate R.

Note that equation (2) can be written

$$P_0 = \frac{EPS_1}{R} + \sum_{t=1}^{\infty} \frac{D_t - EPS_1}{(1+R)^t}. \tag{7}$$

The second term can be interpreted as the net present value of future growth opportunities. Equation (6) follows from equation (7) only if the second term equals zero—i.e., if the firm's future investments yield exactly R on the average.

We see that growth in itself does not invalidate equations (6) and (6a). What does invalidate the formulas is growth that is more or less than minimally profitable.

This result has an interesting practical implication. Suppose it is argued that a utility's earnings-price ratio underestimates R. Then it must also be argued that investors expect the utility to earn more than the cost of equity capital on its future investments.[18]

□ **Measuring risk.** It is clearly better to estimate R from data from a sample of equivalent-risk companies, rather than from data pertaining to the utility in question. But this requires an operational definition of "equivalent risk."

There is no consensus as to how risk should be defined and measured. Nevertheless, it is possible to obtain, from historical data, one or two statistics that are widely used as proxies.

The risk measures most often used stem from Markowitz's formulation of the individual's portfolio selection problem.[19] The investor is assumed to balance R_p, the expected one-period return on his portfolio, against σ_p^2, the variance of R_p. Let x_i equal the proportion of his investment allocated to security i, one of N candidates. Let σ_{ik} be the covariance of R_i and R_k and let $\sigma_i^2 = \sigma_{ii}$. Then

$$R_p = \sum_{i=1}^{N} x_i R_i, \tag{8}$$

[18] This assumes that EPS_1 equals expected average earnings from assets held in $t = 1$. EPS_1 may differ from earnings as actually reported.

[19] See Markowitz [28]. For more extended treatment of the concept and its applications, see Markowitz [29] and Sharpe [45].

$$\sigma_p^2 = \sum_{i=1}^{N} \sum_{k=1}^{N} x_i x_k \sigma_{ik} \tag{9}$$

with $\sum x_i = 1$.

Consider the special case in which the portfolio is limited to one security. For such an undiversified investor the relevant risk of security i is simply σ_i^2. Thus, if it is believed that demand for utility z's shares stems predominantly from undiversified investors—the proverbial widows or orphans who own stock in at most a few firms—then an estimate of σ_z^2 from past data should be a reasonable risk proxy, and a class of equivalent risk securities could be defined by $\sigma_i^2 \cong \sigma_z^2$.

However, it is hard to believe that the special case of widows and orphans is dominant. In general, the risk of security i is its marginal contribution to σ_p^2. This is

$$\frac{\delta \sigma_p^2}{\delta x_i} = 2x_i\sigma_i^2 + 2 \sum_{k \neq i} x_k \sigma_{ik}$$

$$= 2 \sum_{k=1}^{N} x_k \sigma_{ik} = 2\sigma_{ip} . \tag{10}$$

Thus security i's risk is proportional to σ_{ip}, the covariance of R_i and R_p.

As the number of securities in a portfolio increases, R_p becomes more and more closely correlated with R_M, the return on the "market portfolio" composed of all securities. (In fact, a high correlation of R_p and R_M has been found for randomly selected portfolios consisting of as few as ten stocks.)[20] This suggests σ_{iM} as an indicator of the "systematic" or "undiversifiable" risk of security i—the risk relevant to a diversified investor. σ_{iM} is in turn proportional to the coefficient β_i in the linear regression equation

$$R_i = \alpha_i + \beta_i R_M , \tag{11}$$

since β_i is given by σ_{iM}/σ_M^2.

Now, β_i can be estimated from past data. Thus it is a natural proxy for the effective risk of security to the well-diversified investor.

There is disagreement about the relative importance of β_i and σ_i^2 as determinants of R_i, but one and/or the other capture most of what most economists understand as risk.

□ **The capital asset pricing model.** The risk measure β_i was just "derived" on a pragmatic basis, in order to show that it is *one* reasonable risk measure even in the absence of a formal theory of how risk affects security prices. Such justification is available, however, in the so-called capital asset pricing model.[21] Suppose we assume:

(1) That investors have identical assessments of securities' expected returns and risk characteristics,

(2) That the Markowitz model describes their portfolio choice, and

(3) That they can borrow or lend at a given risk-free rate, R_F.

[20] See Evans and Archer [11].

[21] The model is due to Sharpe [44], Lintner [24, 25], and Mossin [35].

Then at equilibrium in perfect markets,

$$R_i - R_F = \beta_i(R_M - R_F)\,,$$
$$\beta_i = \frac{\sigma_{iM}}{\sigma_M{}^2}\,. \tag{12}$$

It is not clear that equation (12) provides a *complete* empirical explanation of asset valuation.[22] But it does lend additional support to the use of β_i as a risk measure.[23]

Note also that if equation (12) is accepted it provides a vehicle for estimating R_i. R_F is approximately observable—a Treasury Bill rate, or a prime commercial paper rate, is customarily used. And presumably R_M, or $R_M - R_F$, will be easier to estimate from historical data than R_i or $R_i - R_F$. However, this approach has not yet been used in a regulatory proceeding.

□ **Further comments on estimation in practice.** It is not my intention to go very deeply into practical problems of estimation. Nevertheless, a few comments may help to put the material just presented in better perspective. The problem is assumed to be estimating the opportunity cost of stockholders in Utility X.

It would be nice if investors' expectations were readily observable. If they were, they would surely be reported in the financial pages; and estimating R for Utility X would be a matter of looking up the currently projected dividends and capital gains, observing X's price, and calculating a rate of return. This would be taken as R_x on the assumption that X's stock is accurately priced relative to alternative equivalent risk investments. A sample of one firm (X) would be sufficient.

This is a never-never land. Suppose, however, we start with a sample of one firm, then postulate that a utility's future growth is relatively stable and predictable, and that it is therefore reasonable to use past trends as proxies for investors' expectations.

1. DCF estimates

Take the case of AT&T.[24] In March 1971 its annual dividend was $2.60, the share price about $49, and the dividend yield 0.053. During the 1960s the growth trend in its earnings per share was 4.6 percent. The trend in dividends per share for the same period was 4.5 percent. Suppose equation (5a) applies. If investors expected continued growth at about 4.5 percent per year, then their expected rate of return must have been $0.053 + 0.045 = 0.098$, that is, about 10 percent.

But it is immediately clear that the future need not be like the past. For example, AT&T's total assets may grow at a different rate,

[22] See Friend and Blume [14] and the several empirical studies in Jensen [20].

[23] Equation (12) also suggests that $R_i - R_F$ and $R_M - R_F$ should be substituted for R_i and R_M in estimating equation (11). Even if equation (12) does not hold exactly, security returns at any point in time depend on R_F, and a more reliable estimate of β_i can be obtained if fluctuations in R_F over time are adjusted for.

[24] The numerical examples following are drawn from my recent testimony [53]. I am not trying to summarize that testimony, nor am I implying that what was done there is necessarily appropriate for other cases. I am using that testimony here as a convenient source of numerical examples.

TABLE 2

COST OF EQUITY CAPITAL ESTIMATES BASED ON SIMULATION MODEL

AVERAGE BOOK RATE OF RETURN ON EQUITY INVESTMENT	LONG-TERM GROWTH RATE OF BELL SYSTEM ASSETS			
	0.07	0.08	0.09	0.10
0.100	0.097	0.098	0.098	a
0.105	0.101	0.102	0.103	0.104
0.110	0.106	0.107	0.108	0.109
0.115	0.110	0.111	0.112	0.113
0.120	0.115	0.116	0.117	0.118
0.125	0.119	0.120	0.121	0.122

[a] NO MEANINGFUL FIGURE EXISTS FOR THIS CASE.

SOURCE: SIMULATION RUNS, DESCRIBED IN [53], APPENDIX B.

and it may be more or less profitable. Since investors took such facts into account in their assessments of expected future earnings and dividends, equation (5a) may not apply.

2. Simulations

The obvious next step is to explore the consequences of alternative assumptions about the future performance of AT&T.

Table 2 shows the long-run rate of return from investments in AT&T stock at $49, under various assumptions about book rate of return on equity (ROI) and long-term asset growth (g_A).[25]

Table 2 should be read in the following way: If investors expect $g_A = 0.08$ and ROI = 0.10, then the cost of capital is 0.098, roughly the same as estimated previously via equation (5a). However, if investors expect $g_A = 0.08$ and ROI = 0.115, then the cost of equity capital must be 0.111; otherwise AT&T's stock would not sell for $49.

Thus, to the extent that it is possible to establish a reasonable range for investors' expectations of asset growth and book profitability, it is possible to specify a range for the cost of capital. For example, if there is no evidence that could justify an expectation of ROI > 0.12 or $g_A > 0.09$, then R must be less than 0.117.

Note that the cost of equity capital estimate increases with the assumed growth in assets. The higher g_A, the greater the present value of growth opportunities (ROI $> R$ in all instances) and the greater the cost of capital needed to explain the observed share price. However, the cost of equity capital estimate is much more sensitive to ROI than g_A, which reflects an interesting problem peculiar to regulated firms. The range of possible variation in ROI is wide partly because of uncertainty about the behavior of AT&T's various regulators. Granted, some of the more extreme values in Table 2 might be rejected as estimates of investors' *expectations*, but the uncertainty persists. This is one more reason why testimony in a regulatory proceeding cannot rest on a sample of one firm. The regulatory process

[25] The table is based on a simulation which is described in detail in [53], Appendix B. The simulation was necessary because of the complexity of the relationship between g_A, ROI, and the projection of dividends and earnings per share. The major complicating element was the necessity for periodic stock issues to finance asset growth at g_A.

introduces an element of uncertainty, which makes it difficult to assess investors' expectations, and thereby makes it difficult to measure the cost of capital. It is obviously necessary to broaden the sample.

3. *Risk classes*

However, broadening the sample requires specification of a risk-equivalent class of stocks. Suppose we make use of the risk proxies described above. Figure 1 plots *ex post* return versus σ and β, respectively, for AT&T and Moody's 24 utilities, a sample of large, well-established electrics. The points shown were calculated from monthly rate of return data covering the 1960–1969 period.[26]

The figure shows that, compared to these utilities, AT&T was a relatively safe investment for the undiversified investor. For a well-diversified investor AT&T's risk was about the same.

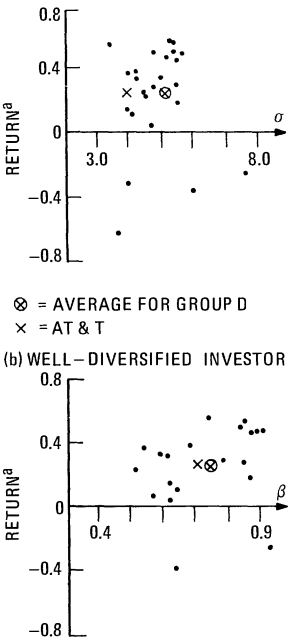
Suppose that the 24 electrics are accepted as an "equivalent risk class." The logical next step is to estimate the cost of equity capital for the utilities. There are several ways in which this could be done. We might observe the average dividend yield of the 24 utilities (0.054) and the average of their 1960–1969 trends in earnings per share (0.06). Then using equation (5a),

$$R = \frac{D_1}{P_0} + g$$

$$= 0.054 + 0.06 = 0.114 .$$

FIGURE 1

RETURN VS. RISK FOR AT&T AND STOCKS IN GROUP D



[a]DEFINED AS THE AVERAGE RISK PREMIUM EARNED, 1960-1969, BASED ON MONTHLY DATA. THE TREASURY BILL RATE WAS USED AS THE RISK–FREE RATE OF INTEREST. FOR FULL DETAILS SEE [53], PP. 49-57 AND ATTACHMENTS H THROUGH N.

4. *The role of judgment*

One can go on to consider other companies, other measures, and other time periods. The only solid generalization is that, at the present state of the art, the final figure for cost of equity capital will be a judgment based on a wide variety of data and techniques. Such judgment is customary in regulatory proceedings; it is not peculiar to estimates of market-based costs of capital. The important point is that judgmental estimates of R do not have to be shots in the dark. One can arrive at rough but plausible estimates of R by using the simple tools I have just described.

5. *Econometric models*

The persuasiveness of "judgmental factors" in cost of capital estimates creates a clear opportunity for effective use of econometric models. Such models may improve the accuracy of the estimates and certainly will make the required judgments more explicit.

There are many recent attempts to estimate the cost of capital via econometric techniques,[27] but the approaches taken are so diverse

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[26] *Ibid.*, pp. 49–57 and Attachments H through N. Since Figures 1(a) and 1(b) are used here only for illustrative purposes, I do not think it necessary to include all of the backup material.

[27] The list includes Miller and Modigliani [30] and the subsequent comments and elaboration on their approach [8], [17], and [42]; Gordon's work for the FCC [51], of which a new version is in preparation; also, Brigham and Gordon [7], McDonald [27], Litzenburger and Rao [26], and others.

that it is impossible to review the field here. More of a consensus will probably have to be reached before such models are routinely used. So far, Gordon's model[28] is the only one presented as evidence in a major regulatory proceeding.

5. Market efficiency and market perfection

■ There are two possible reasons for objecting to the use of the shareholders' opportunity costs in regulatory proceedings. The first is that they cannot be estimated with sufficient accuracy to support reasoned judgment by regulators. This objection cannot be answered *a priori*, but only by experience. The second objection is that data derived from stock market behavior are inappropriate for regulatory proceedings because of the market's irrationality or imperfection. This requires an answer.

□ **Efficiency of the stock market.** Some find it difficult to rest regulatory proceedings on something so volatile as the stock market. But this volatility is basically a reflection of the fact that most assets are risky; and to say that assets are risky means that their values will fluctuate. Uncertainty is a fact of life which happens to be more dramatically disrobed in the stock market than elsewhere. Therefore, the question is not whether the stock market is stable or predictable, since part of its function is to act as a locus for risk-bearing in the economy. The question is whether the market performs this function efficiently.

An "efficient" market is one in which at any point in time security prices fully reflect all information available at that point in time, and in which prices react quickly to new information as it becomes available.[29]

Efficiency can be defined more precisely. Rewriting equation (1) with more elaborate notation,

$$P_{jt}|\Phi_t = \frac{E(\tilde{D}_{j,t+1} + \tilde{P}_{j,t+1}|\Phi_t)}{1 + E(R_j|\Phi_t)}, \qquad (1a)$$

where Φ_t is defined as a set of information. Equation (1a) defines the market's evaluation of j at t, given Φ_t. The market is efficient with *respect* to Φ_t if there is no way to use Φ_t to choose stocks with $E(\tilde{x}_{jt}) > 0$, where $\tilde{x}_{jt} = \tilde{R}_{jt} - E(\tilde{R}_{jt}|\Phi_t)$. Thus there are degrees of efficiency, depending on the breadth of information assumed included in Φ_t.

A relatively weak test is to define Φ_t as past price data and to predict that there is no superior trading strategy based on this information. Since past prices are certainly "available information," there should be no explainable price trends or cycles in an efficient market. This appears to be the case: no trading rule based on past prices has been shown to give abnormally high profits.

In fact, the evidence so far indicates that the U. S. capital markets are basically efficient with respect to a relatively broad set of information, including all data that would be regarded as publicly available. The evidence is ably summarized by Fama.[30]

[28] See [51].
[29] This discussion follows Fama [12].
[30] *Ibid.*

What relevance does this have for the use of finance theory in public utility regulation?

First, the market's efficiency is consistent with perfect markets—which are assumed here, and are usually built into theoretical models of valuation and the cost of capital.

Second, it indicates that observed prices at any time t approximate the equilibrium values, given Φ_t. Thus, an estimate of R at time t should be based on prices at t, not on an average of these and previous prices. There is no point in "smoothing" stock price series.

Third, market efficiency confirms that observed stock prices are closely coupled to information about the possible risks and returns of alternative investment opportunities. Otherwise a firm's "cost of capital" has little meaning or relevance. The measurement of a firm's cost of capital rests on the assumption that its stock is accurately priced relative to other equivalent-risk investments.

To summarize, there is positive evidence that overall capital market operations are basically efficient, and this efficiency is consistent with the hypothesis that market imperfections are minor.

6. Using the cost of capital as a basis for regulation

■ From this point I will assume that an estimate of Utility X's cost of capital is available. The problem is to determine how this figure should be used. I will continue to assume all-equity financing.

□ **A straightforward approach: application to book value rate base.** I turn first to a simple and somewhat exaggerated example. Imagine a utility with book assets (rate base) of \$100 per share. It is all-equity financed. Earnings per share are \$16, all paid out as dividends. Earnings per share are expected to remain constant indefinitely.

Under such conditions, the earnings-price ratio (or the dividend yield) will measure shareholders' opportunity cost correctly. Suppose we observe a current price of \$200. Then

$$R = \frac{\text{EPS}_1}{P_0} = \frac{D_1}{P_0} = \frac{16}{200} = 0.08 .$$

How should the regulatory commission use this information? What I will call the "straightforward approach" is to allow earnings of 8 percent on the usual book value rate base. The price of a utility's product or service will be set at a level sufficient to yield profits of 0.08 (100) or \$8.00 per share.

If investors consider the new earnings level permanent, the utility's stock price will fall to \$100:

$$P_0 = \frac{\text{EPS}_1}{R} = \frac{8.00}{0.08} = 100 .$$

In other words, the straightforward application, in this idealized case, will drive share price to book value per share. The stock sold at \$200 in the first place only because the firm was then earning, and was expected to earn, twice the cost of capital.

A firm's market value will equal book value if it consistently earns a book rate of return equal to the cost of capital.

This example is not intended as a paradigm of ideal regulation. However, I do wish to respond to Ezra Solomon's contention that it and similar approaches are "inherently contradictory and inconsistent"[31] when there is a gap between the cost of equity capital and the book return actually being earned by the utility in question. Walter Morton has come to a similar conclusion:

> What is wrong with [the cost of capital] is that whenever it is applied to a price above book it must . . . cause a fall in earnings and a fall in the price of the stock.
>
> Any theory which postulates that investors pay above book, with the expectation that earnings will be cut as described by regulatory action, must assume either profound ignorance and ineptitude on the part of the investors, or a spirit of masochism which induces them to destroy their own capital.[32]

Actually, there is nothing inconsistent or illogical about the straightforward approach unless it is assumed that investors' expectations (as observed in the process of measuring the cost of capital) should always be confirmed when regulatory commissions act.

Take the simple example. Suppose that investors do not anticipate the rate reduction which forces earnings per share down to $8. The cost of capital is 8 percent both before and after the regulatory decision, so there can be no error or inconsistency in measurement. Rather, what happens is that the expectations investors hold before the regulatory decision (i.e., earnings per share of $16) turn out to be wrong in the event. But the regulatory commission is not bound to confirm investors' expectations. Therefore, the straightforward approach is logically sound. (Whether or not the regulators *should* force earnings per share down to $8 is, of course, another question.)

This discussion illustrates the dangers of using market value (as measured by share price) as a basis for setting earnings levels. The point is explicitly recognized in the Hope decision:

> The fixing of prices, like other applications of the police power, may reduce the value of the property which is being regulated. But the fact that the value is reduced does not mean that the regulation is invalid. . . . It does, however, indicate that "fair value" is the end product of the process of rate-making not the starting point. . . . The heart of the matter is that the rates cannot be made to depend upon "fair value" when the value of the going enterprise depends upon earnings under whatever rates may be anticipated.[33]

In short, "consistency" does not require that a market-based cost of capital must be applied to market value rate base. Actually, the problem with the straightforward approach is not one of inconsistency but of possible difficulties in measurement.

Suppose that market value is initially above book. The regulators announce that they will use the straightforward approach along with the DCF method of measurement. Share price will fall, since investors will anticipate a lower allowed rate of return after the Commission acts. On the other hand, if share price falls, the Commission will overestimate the cost of capital if they assume that investors expect continuation of past earnings. If investors, recognizing this, expect that the regulators will misread their (investors') expectations,

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[31] Testimony of Solomon [60], transcript p. 1044.

[32] [33], p. 22.

[33] Note 1 *supra*, at 601.

TABLE 3

TEXAS EASTERN TRANSMISSION COMPANY– ACTUAL RATES OF RETURN ON EQUITY VS. RATES IMPLIED BY 6.5 PERCENT OVERALL RETURN

YEAR	RATES IMPLIED BY 6.5 PERCENT OVERALL RETURN	ACTUAL RETURN	DIFFERENCE
1965	11.10	14.03	+2.93
1966	10.65	14.44	+3.79
1967	9.98	15.10	+5.12
1968	9.38	16.25	+5.87

SOURCE: FPC DOCKET RP69–13 (PHASE I), INITIAL BRIEF OF COMMISSION STAFF [59].

then clearly, we have the beginnings of a very complicated game. Moreover, there is no guarantee that the players will arrive at a solution in which R is correctly measured.[34]

The solution to this measurement difficulty is not to rely on a sample of one firm, the utility in question, but on a broader sample of equivalent-risk firms.

□ **Will share prices be forced to book value?** In our example, straightforward application of the DCF approach forces share price down to book value per share. This is generally true if the utility can actually be expected to earn the rate set for regulatory purposes. However, this is not always a safe assumption in practice.

This can be illustrated by the actual case of Texas Eastern Transmission Company for the 1965–1968 period. The firm's rate settlement in 1965 was on the basis of an overall rate of return of less than 6.5 percent. If Texas Eastern had actually earned 6.5 percent overall from 1965 through 1968, then it would have achieved the rates of return on book equity indicated in the second column of Table 3. The actual rates of return are shown in the third column.

Although it is difficult to infer exact causes, the fact that utilities can earn more or less than is nominally allowed appears due to four factors.

1. Regulatory lag

The existence of a regulatory lag is necessary but not sufficient. That is, if prices were immediately lowered (raised) whenever a

[34] Suppose that there is no growth trend in the utility's sales, profits, etc., and that the regulators measure R by the earnings-price ratio. Let BV be book value per share and ROI be the book rate of return. Let the superscript ^{0} indicate initial values. Thus, in the numerical example used in this section, $BV = BV^0 = 100$, $EPS^0 = 16$, and $ROI^0 = 0.16$. The regulators are assumed to set $ROI = EPS^0/P$, resulting in a new earnings-per-share of $EPS = ROI(BV^0)$. If investors recognize this, $P = EPS/R$. Thus we have three equations and three unknowns, EPS, ROI, and P. Solving for ROI, we obtain

$$(ROI)^2 = EPS^0 \frac{R}{(BV^0)}$$

or

$$(ROI)^2 = ROI^0(R).$$

Of course if $ROI^0 = R$ then $ROI = R$, but in this case the "game" will never begin. If the game does begin, then ROI^0 must differ from R and thus at the "solution" the new allowed ROI will not equal R either. In the numerical example, this solution will lead to $ROI = 0.113$.

utility's realized return rose above (fell below) the allowed return, then the utility would always earn exactly the allowed return (assuming that there is *some* price which will generate the required profits). But the utility has an opportunity to earn more than the allowed return if regulatory surveillance is lax and/or there is delay in instituting new proceedings.

2. Cost trends

The tendency in regulatory proceedings is to estimate future costs per unit of output on the basis of past, or at best current, costs and output. The likely future changes in cost and output levels are not taken into account systematically. If cost trends are favorable—as a result of technological advances, for example, or of market growth when there are economies of scale—then regulatory lag will allow utilities always to stay somewhat ahead of the game.

3. Factors not under regulatory control

Clearly, if a utility has diversified into nonregulated fields, then restricting the profitability of the regulated portion is not sufficient to insure that the firm's book rate of return equals the cost of capital for the firm as a whole. A similar problem arises when different parts of a firm's operations are regulated by different bodies.

4. Changes in rate base relative to capacity and output

The size of a utility's book value rate base relative to its production capacity and output depends on the average age of its assets—that is, the older the assets the greater the proportion of the initial investment written off as depreciation. Thus, if capacity, output, and operating costs are constant, the utility's book rate of return will increase over time. The same phenomenon will occur if the utility's rate of asset expansion diminishes, other things constant.

Of course, these four factors may work against the utility as well as for it.[35]

In short, a straightforward application of the cost of capital to a book value rate base does not automatically imply that market and book values will be equal. This is an obvious but important point. If straightforward approaches did imply equality of market and book values, then there would be no need to estimate the cost of capital. It would suffice to lower (raise) allowed earnings whenever markets were above (below) book.

☐ **Mixing true and accounting rates of return.** Ezra Solomon has forcefully pointed out one major difficulty in regulatory procedures.[36] As matters stand now, regulation is based on utilities' book rates of return. The trouble is that book rates of return can be poor measures

[35] What about the "differences" shown for Texas Eastern in Table 3? My understanding is that they are due to favorable cost trends and profitable diversification into nonregulated industries. One "favorable cost trend" was a reduction in the effective income tax rate due to the investment tax credit. Incidentally, the rates of return on equity implied by a 6.5-percent overall return declined because embedded debt costs rose over the 1965–1968 period.

[36] Solomon [46]. See also Solomon and Laya [47].

of true (DCF) rates of return. The error's direction and extent can be an extremely complicated function of the firm's growth, the average maturity of its assets, its depreciation and capitalization policy, and inflation and other factors. Solomon concludes correctly that "the rate of return in conventional book rate units is conceptually and numerically different from the rate of return in DCF units," and that "two companies with similar DCF rates of return may well show widely differing book rates of return."[37]

Clearly, this is a potentially significant problem. How should regulatory decisions respond to possible biases in book rates of return? Do biases make use of cost of capital estimates inferior to rates of return based on traditional interpretations of the comparable earnings standard?

Suppose we accept that the possible biases are very difficult to estimate and adjust for. Then the traditional interpretation has an apparent advantage of consistency, in the sense that a utility's allowed book rate of return is compared to the book returns of other firms. However, consistency would also require that the utility's performance should be compared with the performance of firms whose book rates are subject to similar biases.

This only aggravates the problems in using the traditional interpretation. The firms most likely to have similarly biased book returns are other utilities. But their returns partly reflect past regulatory actions and thus do not provide an independent standard. Book returns of unregulated firms can be used, but such firms are likely to report book returns subject to different and possibly more severe biases than utilities' returns.

The alternative is to rely on the cost of capital concept. In this case regulators are faced with the possibility that the utility's apparent (book) rate of return may be different from the true (DCF) rate of return actually being earned by the utility.[38]

Evidently difficulties exist regardless of the interpretation of comparable earnings. At the present state of the art, the possible biases just discussed above provide no grounds for preferring the traditional interpretation of the comparable earnings standard to the interpretation presented here. The matter is ripe for further research.

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[37] [46], p. 78.

[38] Actually, the difficulties which arise when this concept is relied upon seem to be more tractable—in the long run, at least—than if the traditional approach is used. The bias need be assessed for only one firm rather than for the broad sample of firms required to implement the traditional approach. It also seems likely that the regulatory process itself restricts the bias. If a regulatory commission decides to allow a return R, and adjusts the utility's prices frequently enough that the utility always earns R on a book basis, then the utility will earn the same true return R. It must be granted that regulation does not work this perfectly. There are lags and therefore some fluctuations in book returns with unknown effects on true returns. Allowed rates of return change from time to time. Inflation is a factor. The likely effects of all these items probably cannot be assessed without building a relatively detailed simulation model. Nevertheless, I think we can anticipate the likely results of such a simulation. The biases in the book return are associated with variation in individual assets' book returns over the assets' lives. The regulatory process diminishes this variation. Since its extent is probably much less for utilities than for manufacturing companies or other unregulated firms, the bias in utilities' book returns will probably be relatively small. This argument is made in more detail by Trapnell [49].

□ **Inflation.** A book value rate base is the original cost of assets less depreciation. Neither component is adjusted to reflect experienced inflation, which raises two questions:

(1) Does fair play require an "inflation adjustment" to either the rate base or the allowed rate of return?

(2) Is such an adjustment required for efficient allocation of resources?

I consider only the first question here and defer the second until later on in the paper.

The classic formulation of the problems of regulation in inflationary times is Walter Morton's.[39] His answer to question (1) is yes. This answer rests on a value judgment—more precisely on an operational idea of fair treatment for utility investors.[40] Unfortunately, the requirements of "fair treatment" are not clearly defined in practice.

First, note that the cost of capital, as defined here, includes an adjustment for expected inflation. Investors' opportunity costs are estimated in nominal, not real, terms. Further, since "risk" here is related to uncertainty about nominal returns, it reflects uncertainty about future inflation and its possible effects on the regulated firm. (The effects depend in turn on the responses of regulators to various degrees of experienced inflation.)

One might visualize an implicit contract between investors and regulators, specifying the regulators' response to experienced inflation among other things. The question of whether investors are being treated fairly at any point in time depends on whether the implicit contract is being honored by the regulators.

Consider again the numerical example introduced at the start of this section. The cost of capital is 8 percent and the rate base is $100. Suppose the 8-percent rate of return includes investors' expectation of 2-percent-per-year inflation.

Thus the regulators allow earnings of 0.08(100) = $8. Price is

$$P_0 = \frac{\text{EPS}_1}{R} = \frac{D_1}{R} = \frac{8}{0.08} = \$100\,.$$

Now assume that there is actually 10-percent inflation in $t = 1$, 8 percent more than expected. However, by the start of $t = 2$, investors expect inflation to drop to the "normal" 2-percent-per-year rate. Then R is again 0.08 at the start of period 2 and, according to the straightforward approach, no adjustment in the utility's allowed return is necessary. Share price will remain at $100. The utility's shareholders' wealth is $108 per share at the start of $t = 2$, including earnings paid out during $t = 1$. Obviously their real rate of return is negative.

Is this fair? It depends entirely on whether the "contract" between regulators and investors calls for investors to absorb the risks of greater-than-expected inflation. In real life, the "contract" is so vague that there is very little ground for calling any regulatory strategy fair or unfair. However, the straightforward application of the cost of capital to the book value rate base is not unfair as long as it is applied consistently.

[39] See [33].

[40] See [34], p. 122 *ff.*

7. Finance theory and the goals of regulation

■ In the last section I considered several possible objections to use of utilities' costs of capital as a basis for their regulation. By and large the objections can be answered. But at best this shows that regulation *can* be based on finance theory; it does not show that it *should* be. Thus we must turn to a more fundamental question: What are the goals of rate of return regulation, and to what extent can these goals be met by procedures based on finance theory?

To some extent the specification of goals is a matter complicated by the necessity for value judgements. An investor who purchases shares of Utility X at $200 in good faith will feel cheated by any regulatory decision which hands him a $100 capital loss. On the other hand, regulators cannot be bound to confirm investors' expectations in all instances.

Finance and economics are not very helpful when the problem of regulation is framed as "consumers vs. investors." Instead I will assume that regulation is intended as a substitute for competition. Thus, a "fair return" will be defined in terms of the competitive standard.

□ **"Fair return" and the competitive standard.** Ideal regulation forces the utility to operate at competitive levels of investment, price, output, and profit.

This is difficult, perhaps impossible, to achieve in practice. Clearly, rate of return regulation can reduce or eliminate "monopoly profits;" but it is not so clear that such regulation produces the investments, outputs, or prices that would occur if a competitive solution could be achieved.

Moreover, in "naturally monopolistic" industries, with systematically decreasing average costs, a fully competitive market is not a realistic alternative. In this case, we might conclude that

> the function of regulation is to preserve for the public, instead of the producer, the benefits arising from legal monopoly without depriving the investor of a competitive profit.[41]

Thus it is natural to begin with the problem of eliminating "monopoly profits"—or, to put it more positively, the problem of providing the "fair" rate of return that would obtain in a competitive market.

What does "monopoly profits" mean? Suppose we observe an unregulated firm that has recently been very successful, one that has been able to earn more than its cost of capital. Are these high returns monopoly profits? Not necessarily: the firm may be in a competitive industry in which very high profits were not expected. (They were perhaps hoped for, but the hopes were balanced by fear of losses.) The rate of return actually being earned may be a pleasant surprise.

A superior rate of return will be a "short-run" phenomenon in competitive markets. Such a return will erode as markets shift towards long-run equilibrium. However, short-run profits or losses are more the rule than the exception. In real life the path of adjustment to long-run equilibrium will not be smooth, because of uncertainty and because the target itself will be continually changing.

In short, the theory of competitive markets provides no grounds for enforcing *ex post* equality of a utility's rate of return on assets

[41] *Ibid.*, p. 94.

and its cost of capital. It is more relevant to consider rates of return *ex ante.*

Long-run equilibrium in competitive markets implies that the average expected rate of return on new capital investment equals the cost of capital.[42] If the average expected rate of return does not equal the cost of capital then there will be entry or exit from the industry. Thus, if the aim is to eliminate monopoly profits, this principle follows:

Regulation should assure that the average expected rate of return on desired new investment is equal to the utility's cost of capital.

This principle follows if "fair return" is understood in terms of the competitive standard. If the principle is accepted, it obviously follows that rate of return regulation should be based on finance theory and the cost of capital concept.

□ **What "fair return" does and does not imply**. Before considering how to implement the principle, it will help to summarize some other things it does and does not imply.

(1) Note that an opportunity to invest in a project offering more than the cost of capital generates an immediate capital gain for investors. This is a windfall gain, since it is realized *ex ante.*

(2) A firm which can expect to earn its cost of capital on new investment meets the "capital attraction standard." This follows from the very definition of the cost of capital.

(3) Adherence to the principle implies that expected return to the equity owner is "commensurate with returns on investments in other enterprises having corresponding risks." Thus the principle is consistent with the comparable earnings standard established by the Hope case, provided that the standard is interpreted in terms of investors' opportunity costs.

(4) There are several things that the principle does not imply. It does not specify returns *ex post;* it is solely an *ex ante* concept. The existence of competitive markets does not require that expectations be realized for any asset, or even for all assets over any given period of time. Regulators can eliminate unexpectedly high or low rates of return after the fact, but only if they are willing to make the firm a risk-free investment.

(5) The principle says nothing about whether regulation should aim to make utilities safe or risky enterprises.

(6) Finally, it should be reemphasized that adherence to the principle does not guarantee that the utility will operate at competitive levels of price, output, and investment. This can easily be shown; it follows from the absence of any unique relationship between these variables and the *ex ante* rate of return on investment. There are many combinations of price, output, cost, and investment as well as many combinations of the various factors of production which will yield an expected rate of return equal to the cost of

[42] It is always true that the firm will invest up to the point where the marginal expected return on investment equals its cost of capital. This is so for both perfect competitors and monopolists, in both the short or the long run; thus, it provides no guidance for regulation.

capital. Further, there is no reason to suppose that the risk class the firm finally ends up in will be the same class that would prevail in a competitive environment.

□ **Implementing the idea of fair return.** The principle that utilities ought to expect to earn the cost of capital on new investment is general enough to be compatible with a wide variety of regulatory schemes. Which one should be used? It is not yet possible to answer this question definitively. Nevertheless, a good deal can be said about the pros and cons of the most obvious alternatives.

In many ways the simplest approach is the "straightforward" approach with no regulatory lag. That is, the utility's product is priced at the start of each period t so that

$$REV_t = C_t + Z_t + R_t BV_t, \tag{13}$$

where

REV_t = anticipated revenues in t,
C_t = anticipated operating costs in t,
Z_t = depreciation to be charged in t,
BV_t = the rate base at the start of t—i.e., the book value of the utility's assets at that time, and
R_t = the utility's cost of capital measured at the start of t.

"No regulatory lag" means that the time from t to $t + 1$ is short enough so that deviations of actual, from anticipated, revenue and cost are not significant. Of course, it may not be easy to find a price such that equation (13) holds; both REV_t and C_t depend on output, which is in turn a function of price. But I will assume that regulators solve this problem somehow. Now consider the pros and cons of such a proposal.

Pros

First, the cost of capital will be relatively easy to measure, since a utility operating under the scheme just described will tend to be a very safe investment. The only uncertainties involve:

(1) Future changes in the cost of capital, and
(2) The possibility that there may be no price which will generate the required revenue.

It is hard to believe that an established utility facing only these uncertainties would have a cost of capital much greater than corporate bond yields. (Note that holders of corporate bonds also face the first source of uncertainty.)

Second, such a scheme would be easy to administer. The rate cases would be frequent, but routine.

Cons

There are, however, serious disadvantages. For one thing, a low cost of capital is not necessarily a good thing. There is no basis for assuming that, in a competitive market, uncertainty about operating costs would be borne almost entirely by consumers, as would be the case under this rule. Consequently, this is not likely to be an optimum allocation of risk bearing.

But the most serious item is that there is very little incentive for the utility to be efficient in choice of factor proportions, capacity, price and output, or technology. If the utility can expect to earn no more nor less than its cost of capital, then it has no incentive to seek efficiency along any of these dimensions.

It might be thought that a slight compromise of the principle—i.e., allowing the utility to expect to earn a rate R^* which is a bit greater than R—would establish the proper incentives. However, Averch and Johnson[43] have shown that the condition $R^* > R$ creates an incentive for firms to use more than the efficient amount of capital relative to other factors of production. Moreover, it is possible for the inefficiency in factor proportions to increase as the difference between R^* and R decreases.[44] Thus the compromise does not seem helpful, assuming use of the straightforward approach with no lag.

The charge of inefficiency is reinforced by Irwin Friend's argument,[45] which goes as follows. Suppose the utility is regulated by the straightforward approach, with no lag. Nevertheless, it is acting in good faith and trying to be efficient. The utility finds itself faced with a wide range of investment opportunities, some "good"—i.e., offering a rate of return greater than R—and some "bad." Efficiency would seem to call for taking only "good" projects. But this would lead to an average rate of return higher than R. Thus the utility might just as well forgo the good projects or balance them with bad ones.

In short, the straightforward approach sans lag has little to recommend it. It meets the standard of "fair return" but it accomplishes little else. In particular, it removes any incentive for efficient operating or capital budgeting procedures.

□ **Conscious use of regulatory lag.** As I have now emphasized several times, firms in a competitive industry will not earn the cost of capital at all points in time. *Ex post* returns can deviate substantially from the cost of capital in the short run. The duration of the deviations will be limited by the time required by firms to invest (or dis-invest) and enter (or leave) the industry. A regulatory lag provides a short run in which utilities can earn unexpectedly high or low profits, and the rate proceeding at the end of the lag can play a role analogous to the forces which drive competitive industries towards long-run equilibrium.

Consider, then, regulation according to the straightforward approach but with *conscious* use of regulatory lag. I emphasize "conscious:" although there is inevitably a lag in practice, this does not necessarily imply a tolerance for surprisingly high or low rates of return. Rather, it seems to reflect a willingness to put off the next rate proceeding until profits get out of line.

With conscious use of regulatory lag, prices would be set and then left unchanged for several periods. Equation (13) would remain the starting point for determining the appropriate price. However, there are some additional complications. Suppose it turns out that trends in cost, technology, demand, etc. consistently favor the utility. Then

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[43] See [1].

[44] See Baumol and Klevorick on this point [18], pp. 175–76. The Baumol-Klevorick article reviews the extensive literature on the Averch-Johnson thesis.

[45] See Friend [50] and [37], p. 4.

in principle the regulators should take account of the trends. That is, revenues allowed in t would have to be lower than REV_t as given by equation (13), so that

$$\sum_{\tau=t+1}^{t+L} \frac{REV_\tau - \overline{REV}_\tau}{(1 + R_t)^{\tau-t}} = 0\,, \tag{14}$$

where

$\overline{REV}_\tau$ = revenues expected in τ, given the price set at t;
REV_τ = revenues expected to satisfy equation (13) in τ, and
L = anticipated length of the lag.

This condition is necessary for the utility to expect to earn the cost of capital on investments undertaken in t and subsequently.

Practical difficulties

The necessity for equation (14) means that the longer the lag, the greater the administrative difficulty. To some extent there must be regulation *ex ante*, which provides for endless argument. Moreover, the utility now has the incentive to overestimate future costs. These difficulties can be ignored, but only at the expense of possibly violating the principle that utilities ought to expect to earn the cost of capital on new investment.

Another disadvantage is the difficulty in determining the appropriate duration of the lag. This cannot be left entirely to the utility, because then the lag would be short when profits are low and long when they are high. Further, it makes sense to accept unexpectedly high profits for a relatively long time if they are due to unusual managerial efficiency, but to cut the lag short if the high profits stem from the exploitation of the utility's monopoly position. At best, the straightforward approach *cum* lag could not be a formula for regulation but only an approach to it.

Effects of the regulatory lag on efficiency

The existence of a regulatory lag clearly provides the utility with an incentive to improve efficiency. The incentive appears along several dimensions:

(1) Suppose the allowed rate of return equals the cost of capital. Bailey and Coleman[46] have shown that existence of a regulatory lag will induce the utility (a) to use factors of production in efficient porportions and (b) to produce more than would an unconstrained monopoly.
(2) Existence of a lag allows the utility to capture some of the rewards of managerial efficiency and of cost-reducing innovation.[47]
(3) The lag encourages efficient capital budgeting procedures. There is a positive incentive to avoid "bad" projects offering returns less than the cost of capital, and an incentive to disengage from "bad" projects previously undertaken.

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[46] In [2]. Bailey and Coleman also show that the Averch-Johnson effects persist when there is a lag and the allowed rate of return is *above* the cost of capital.

[47] See Baumol and Klevorick [4], pp. 182–89.

Thus, although we cannot guarantee that a straightforward approach *cum* lag will lead exactly to the competitive solution, it does move the utility in the right directions. The inclusion of a lag does not make this strategy any more or less fair, but it makes the utility more efficient.

□ **A tentative proposal.** The implications of the discussion so far can be summarized by offering a tentative proposal. Regulators should:

(1) Determine a price for the utility's product or service such that it can expect to earn its cost of capital, given the current cost and demand functions, rate base, and scheduled depreciation.
(2) Check to see whether the utility can be expected to earn more (less) than the cost of capital in subsequent periods, given the price set at $t = 1$. If so, lower (raise) the price so that the utility can expect to earn its cost of capital over the period of the anticipated lag.
(3) Tolerate unusually high or low profits during the period of regulatory lag. The length of the lag should roughly correspond to what the short run would be if there were a competitive market—that is, the length of time necessary to adjust the amount of fixed factors of production in response to changed conditions.

Admittedly, there would be compromises in practice. Because of administrative difficulties, step (2) would probably have to be skipped except in very clear-cut cases, and any adjustment would probably be based on judgment rather than explicit use of equation (14).

This proposal differs from current procedures primarily in the conscious use of regulatory lag. It is probably not the best strategy in any ultimate sense. There are many other strategies that are consistent with the principle that utilities ought to expect to earn their cost of capital on new investment; and it will be surprising if none among these turn out to be better, at least in theory, than the straightforward approach *cum* lag. Nevertheless, this proposed approach seems attractive pending rigorous examination of alternatives.

The search for alternative regulatory strategies might proceed in any one of several directions. One open question is whether use of a book value rate base leads to the best attainable regulatory decisions. This matter is briefly reviewed in the next section.

8. Determining the appropriate rate base

■ There are basically three different concepts of rate base that could be employed. They will be abbreviated as follows:

BV Book value, based on the usual accounting principles.
SMV Stock market value, i.e., number of shares outstanding times price per share.
CMV Competitive market value, i.e., whatever the utility's assets would be worth at long-run equilibrium in a competitive market.

CMV can also be defined as the original cost of the firm's assets less economic depreciation. Similarly, BV equals original cost less accounting depreciation.

Some state commissions employ a fourth concept, the "fair value" rate base; but this need not delay us. In practice, fair value seems to be defined as book value plus a modest *ad hoc* adjustment.

Thus far, all I have said is that SMV is not useful in defining a utility's rate base. There are several reasons why. First, since SMV depends on how investors expect the regulators to act, it should be the "end result . . . not the starting point."[48] Second, adopting SMV as a rate base amounts to a commitment to confirm investors' expectations regardless of what they are based on. Third, if SMV is maintained consistently above (below) BV then the utility will expect to earn a rate of return on its new investment which is greater than (less than) the cost of capital.

But what about CMV as an alternative to BV?

□ **Determinants of CMV relative to BV.** The concept of a CMV rate base originates in the standard theory of competitive markets. It will help to review the determinants of CMV according to this theory.

Long-run equilibrium requires that the expected rate of return on a firm's CMV be R, its cost of capital. This must be true both in an average and a marginal sense. If the marginal return on the CMV of new assets is not R, then the firm's investment decision can be improved. If the average return on the CMV of all assets is greater than R, then there will be entry of new firms; if it is less than R, capital will be withdrawn from the industry.

There are several ways to state this formally, but the most useful starts with an analogue to equation (13):

$$REV_t = \pi_t Q_t = C_t + \hat{Z}_t + R_t \mathrm{CMV}_t , \tag{15}$$

where

$\pi_t Q_t$ = equilibrium price times quantity to be produced during the period from t to $t + 1$,
$\hat{Z}_t$ = expected economic depreciation from t to $t + 1$,
C_t = expected out-of-pocket cost of producing Q_t, and
R_t = cost of capital measured at t.

Long-run competitive equilibrium requires that equation (15) holds when $\pi_t = \mathrm{LRMC}_t$, where LRMC represents long-run marginal cost. For simplicity, let us omit the t's. Then the following equation may be regarded as an implicit definition of the CMV of the firm's assets:

$$\frac{R(\mathrm{CMV}) + \hat{Z} + C}{Q} = \pi = \mathrm{LRMC} . \tag{16}$$

That is, given the equilibrium price π, each firm's CMV will adjust so that equation (16) holds. Of course competitive equilibrium also requires that $\pi = \mathrm{LRAC}$, long-run average cost.

Under these conditions, the CMV of any new asset is simply its purchase price. Suppose a firm invests $100 in new assets during a given year. The firm is in a competitive industry which is at long-run equilibrium. We know that the expected rate of return on the 100th dollar must be R; consequently, this marginal dollar must contribute exactly $1 to both CMV and BV. However, the average expected rate

[48] Note 1 *supra*, at 601.

of return on the \$100 invested must also be R; otherwise there would be an incentive for capital to enter or exit from the industry. Thus the other \$99 invested must contribute exactly \$99 to BV and CMV. The total CMV of the firm's "old" and "new" assets is determined by equation (16).[49]

Now let us carry equation (16) over into the regulatory arena as the definition of the CMV rate base. Under what conditions will a utility's CMV and BV rate bases differ?

The answer is clearest when we consider a utility that is started "from scratch." The utility's initial rate base is its gross investment outlay. For simplicity, assume scheduled book depreciation equals expected economic depreciation $\hat{Z}$. Then

$$\text{LRAC} = \frac{C + \hat{Z} + R(\text{BV})}{Q}. \tag{17}$$

Comparing equations (16) and (17), it is clear that CMV $\gtreqless$ BV as LRMC $\gtreqless$ LRAC.

This argument reflects the essential equivalence between use of a CMV rate base and LRMC pricing. That is, one way to test whether a firm's CMV differs from its existing BV rate base is to see whether there is a difference between (1) the price derived from straightforward application of the cost of capital to BV and (2) long-run marginal cost of new capacity, based on the most efficient available technology. If price is greater than LRMC, then BV is greater than CMV, and conversely. Thus, the straightforward approach based on CMV is exactly equivalent to (long-run) marginal cost pricing.[50]

□ **Effects of using a CMV rate base.** It is obvious that regulation by the straightforward approach, under which the utility expects to earn the cost of capital on BV, cannot be expected to lead to the competitive solution unless BV = CMV—that is, unless accumulated book depreciation approximates economic depreciation.

There are no procedural difficulties in applying the straightforward approach *cum* lag to a CMV rate base, assuming that CMV can be estimated. (The estimation of CMV is difficult, particularly for utilities, but probably not impossible.)[51] Use of CMV would call for (1) an attempt to reflect expected economic depreciation in book depreciation schedules and (2) periodic write-ups or write-downs of the

[49] It is *not* determined by the reproduction cost of the old assets. If "reproduction cost" is used to define rate base, it must be in the sense of providing equivalent capacity with the latest equipment and procedures. But reproduction cost so defined is simply the CMV of the old assets.

[50] Here I ignore complications introduced by regulatory lag.

[51] The special complicating factors for regulated firms include the following:

(1) If a CMV rate base is used, the utility has an incentive to overdepreciate, thereby raising its price and increasing the immediate cash return. The excess depreciation could always be made up later by an *ad hoc* write-up of assets.

(2) A CMV rate base dilutes the utility's incentive to embrace technological change. Investment in radically more efficient assets, for example, would lead to a write-down of the value of old assets.

(3) In the case of unregulated firms, SMV may be a reasonable proxy for CMV. Unfortunately, the existence of regulation breaks the link between SMV and CMV.

rate base in response to unexpected developments.[52] However, strict use of a CMV rate base is *not* always consistent with the comparable earnings standard—that is, not always consistent with the proposition that the utility ought to expect to earn its cost of capital on new investment.

Consider again the case of the utility started from scratch. Suppose it is regulated according to a "straightforward approach" but with a CMV rate base. Then if LRMC is less than LRAC (the usual condition for a "natural monopoly") the utility can expect to earn less than R on its investment, since there will be an immediate write-down of the BV of this investment to CMV. Conversely, if LRMC > LRAC, then the utility's shareholders will receive an immediate capital gain due to a write-up of BV. Only in the case of LRMC = LRAC will this regulatory scheme adhere to the principle emphasized above, namely that a utility ought to expect to earn the cost of capital on its new investment.

It is interesting to compare this discussion with Klevorick's.[53] He found that maximization of social welfare will sometimes require that the firm be allowed to earn an average rate of return on investment that is different from the cost of capital. We have arrived at an essentially equivalent result by a somewhat more direct route. The result is that LRMC pricing (the usual condition for welfare maximization and efficient allocation of resources) will not yield an average return on investment equal to the cost of capital unless LRMC = LRAC.

□ **Conclusions.** In one sense, this is a moot result, since plausible estimates of economic depreciation or LRMC have not yet been obtained. It is not clear whether a switch to CMV rate base would require a write-up or write-down of existing BV rate bases. It may turn out that average and marginal costs are roughly equal.

The immediate implication is that more thought is required on a variety of questions. For example:

(1) Can LRMC be measured in a practical context? That is, are there administratively feasible ways to construct economic depreciation schedules or CMV rate bases?

(2) Does LRMC in fact differ from LRAC? Does application of the cost of capital to utilities' actual BV rate bases result in prices substantially different from long-run marginal costs?

(3) If the answers to question (2) are yes, might it not be possible to have your cake and eat it too (i.e., to reconcile the conflict of marginal cost pricing with the comparable earnings principle) by adopting a two-part tariff? The "use" charge would be set equal to LRMC and the "capacity" charge then adjusted so that the utility expects to earn the cost of capital on its new investment.

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[52] The write-ups and -downs of CMV would presumably lead to corresponding changes in SMV. However, stockholders could be insulated from these changes. If they were included in ordinary income, for example, about 50 percent of the effect would be offset by extra taxes or tax shields. Alternatively, the changes could be passed on to consumers via a one-time credit or charge. It makes little difference, from an economic standpoint, which scheme is used.

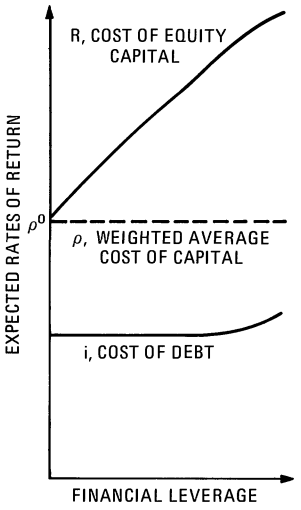
[53] See [21].

■ **Implications of finance theory.** The paper up to this point is an attempt to analyze—and to resolve, if possible—all the evident problems in applying finance theory to rate of return regulation. However, the analysis assumes that utilities are all-equity financed, which is of course not so. Thus it remains to be considered how a mixture of debt and equity financing alters the analysis. The first item is to review the theory and measurement of the cost of capital when capital structures include securities other than common stocks.

Measurement

FIGURE 2

EFFECTS OF FINANCIAL LEVERAGE ON COSTS OF DEBT AND EQUITY FINANCING AND THE WEIGHTED AVERAGE COST OF CAPITAL



Suppose we begin with a utility that is all-equity financed. If the utility now revises its capital structure to include some debt, the cost of equity capital (R) will rise, because financial leverage makes the firm's stock riskier. The interest rate, i, on the firm's borrowing will, of course, be less than the cost of equity capital. Figure 2 shows how R and i vary as a function of financial leverage. It should be intuitively clear that the utility's overall cost of capital, ρ, can be measured as a weighted average of R and i. It is not necessarily true that ρ will be constant, however.

Assume first that the firm's debt-equity mix is not expected to change. To get an exact measurement of ρ, given R and i, we can apply the same logic used to develop the cost of capital concept for the case of all-equity financing. Regardless of the degree of financial leverage, it is still possible to invest in the firm as a whole—i.e., in its assets, as distinct from any particular security. Investors can do this simply by purchasing each of the utility's financing instruments in appropriate proportions. Thus, suppose that the utility had $100 million debt outstanding (market value) and outstanding stock with a market value of $150 million. Then it would suffice to invest 40 percent of the portfolio in the utility's bonds and 60 percent in its stock.

Consider the opportunity cost of investors holding such a portfolio. The portfolio falls into a class of equivalent-risk securities and portfolios. If the expected rate of return for this class is, say, 10 percent, then the utility's stock price will adjust so that the portfolio of the utility's stocks and bonds will likewise offer an expected return of 10 percent. This 10-percent opportunity cost is the firm's overall, or "weighted average," cost of capital.

Thus, the overall cost of capital can be measured by the expected return on a portfolio of the firm's financing instruments:

$$\rho = i(D/V) + R(E/V), \tag{18}$$

where

i = current average yield to maturity of the firm's outstanding debt,

R = expected rate of return offered by the firm's stock—i.e., its cost of equity capital,

D = market value of the firm's outstanding debt,

E = aggregate market value of outstanding stock, and

$V = D + E$.

This assumes there are only two kinds of financing instruments, debt and common equity. But the weighting principle remains the same if there are others, such as preferred stock, subordinate deben-

tures, convertible securities, etc. Of the variables used to compute the weighted-average cost of capital, only R, the cost of equity capital, is not directly observable. I have already discussed how it can be estimated.

Use of ρ as a rate of return standard

The overall cost of capital ρ is here defined as the opportunity cost of investing in a firm's *assets*. Therefore the concept and definition of ρ is the same regardless of whether the firm is financed entirely by equity or by debt and equity. The actual financing package must be taken into account in measuring ρ, but the firm's use of debt does not make measurement more difficult. Thus the conclusions reached in earlier sections of this paper are not at all dependent on the assumption of all-equity financing, provided the financing mix is taken as given. However, we face a whole new class of problems if the debt-equity ratio is expected to change. Clearly there will be a change not only in D and E, but also in R and possibly i and ρ.

Effects of changes in debt-equity ratios

The starting point in the analysis of changes in the financing mix is Modigliani and Miller's (MM's) famous Proposition I,[54] which states simply that V and ρ are constants, independent of leverage. The proposition depends on three assumptions:

(1) The existence of perfect markets;
(2) That changes in financial leverage do not affect the firm's assets, future investments, or the size and risk characteristics of its income stream; and
(3) The absence of corporate income taxes—or, alternatively, that interest charges are not tax deductable.

Figure 2 is drawn to conform with MM's Proposition I.

Let us consider the assumptions in the order stated. First, capital markets are not strictly perfect. It can thus be argued that imperfections are sufficient to negate Proposition I as an acceptable generalization. Durand's comment on MM[55] is a cogent presentation of this point of view, which is usually taken to imply that ρ is a shallow, U-shaped function of financial leverage, rather than the flat line drawn in Figure 2.

I will not discuss assumption (2) here.[56] It is not likely to be important except for firms that are levered to the point where there is a noticable probability of financial embarrassment. This is not the usual case for regulated utilities.

The tax effects are clearly substantial, however. In order to isolate them, we will assume that assumptions (1) and (2) are satisfied. Then MM's Proposition I implies, in general, that[57]

$$V = V^0 + \text{PVTS}, \tag{19}$$

[54] Modigliani and Miller [32].

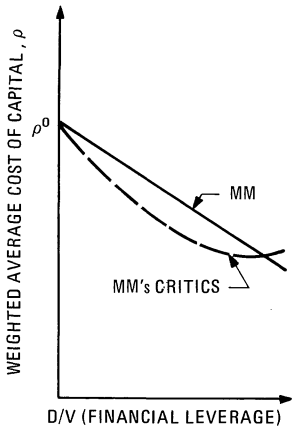
[55] See [9].

[56] The role of factors covered by this assumption is treated in Robichek and Myers [41], especially p. 16, and Baxter [5].

[57] See Robichek and Myers [41], pp. 13–15.

FIGURE 3

EFFECTS OF FINANCIAL LEVERAGE ON THE WEIGHTED AVERAGE COST OF CAPITAL WHEN CORPORATE INCOME IS TAXED



where the superscript ^{0} indicates what the value of V would be if the firm were all-equity financed, and PVTS stands for the present value of tax savings due to the deductability of interest on the firm's debt. More specifically, suppose that the firm has no growth opportunities, so that equation (6) applies. Then

$$V = \frac{X(1 + T_c)}{\rho^0} + T_c D\,, \tag{19a}$$

where

T_c = the corporate tax rate,
ρ^0 = the firm's cost of equity capital if it were all-equity financed, and
X = the firm's expected income before interest and taxes.

This implies that ρ, as defined via equation (18), is also given by[58]

$$\rho = \rho^0 - T_c(\rho^0 - i)D/V\,. \tag{20}$$

The implied behavior of ρ vs. D/V is shown in Figure 3 by the downward-sloping solid line. To repeat, this assumes that MM's proposition I holds exactly except for tax effects—i.e., that the line would be horizontal in the absence of such effects.

If MM's critics are right, the true relationship is like the dashed line in Figure 3. Unfortunately, there is no theory for this case specifying an exact functional relationship comparable to equation (20). Therefore I will continue to use MM's equations for purposes of discussion.

Equation (20) applies regardless of whether the firm is regulated or not. This may seem surprising in view of the treatment of taxes in regulatory proceedings. The usual procedure is to treat a utility's tax bill as an operating cost. If taxes change, the price of the utility's product or service is adjusted to provide an offsetting change in revenue. Thus, if a utility issues more debt, thereby reducing taxes relative to equity financing, the tax savings will be passed on to consumers in the form of lower prices. However, this does not change either equation (19) or (20); but it does make X, earnings before interest and taxes, a function of D. Specifically, for a regulated firm,[59]

$$X = X^0 - T_c i D\,, \tag{21}$$

where X^0 equals earnings before interest and taxes if the utility is all-equity financed. For an unregulated firm, $X = X^0$.

To put it another way, both regulated and nonregulated firms benefit from debt via a lower cost of capital, ρ. But unregulated firms benefit further in that X is *not* decreased to offset tax savings, as is (presumably) the case for regulated firms.

□ **Practical implications of possible changes in financial leverage.** The implications of all this can be summed up in Figure 3, in which the solid line represents equation (20) and the dashed line incorporates the effects of the market imperfections which MM's critics think are

[58] See Modigliani and Miller [31], p. 439.

[59] See Elton and Gruber [10] for a more detailed discussion of taxes and the regulated firm's cost of capital.

important.[60] However, there are implications for regulation regardless of which view is correct. One point is that a measurement of ρ on the basis of an observed capital structure will be in error if investors expect capital structure to change.

What is the possible magnitude of the error? Suppose equation (20) is right, and that a utility announces that it will shift D/V by 10 percent. Suppose that $T_c = 0.5$ and $\rho^0 - i = 0.05$. Then ρ will change by $T_c(\rho^0 - 1)\Delta D/V = 0.5(0.05)0.1 = 0.0025$, or 0.25 percent. In a practical context this is not a very large number, for several reasons:

(1) If MM's critics are right, and the utility's D/V ratio puts it in the trough of the dashed U-shaped curve in Figure 3, then ρ will change by less than equation (20) would indicate.

(2) It could easily take several years for a firm to shift its capital structure by 10 percent.[61]

(3) Any error in measuring ρ will persist only during the regulatory lag.

(4) To be sure, ± 0.25 percent may amount to a lot of dollars. But it would explain only a fraction of the differences in the proposed costs of capital presented by the various parties in an actual regulatory proceeding.

To summarize, it does not seem too dangerous to estimate a utility's cost of capital on the assumption of a constant debt-equity ratio. Although a planned, major, rapid shift in capital structure should be taken into account, such shifts are presumably more the exception than the rule.

□ **Regulation of capital structure.** Now we may turn to a different problem: Should utilities' capital structures be regulated? At first glance, the objective of regulating capital structure would seem to be minimization of the weighted-average cost of capital. However, it is not at all clear that this is a good thing.

Suppose MM are right, so that equation (20) holds. Then ρ will decline with financial leverage, but only because the effect of the tax subsidy to debt financing is to reduce the risk of a portfolio of the firm's stocks and bonds. However, the firm's assets are no more nor less risky: It is simply that a part of the risk is absorbed by "we the people" via fluctuations in the corporate income tax revenues. Why should this be an objective of national economic policy?

If MM's critics are right, then ρ may also decline because of market imperfections. That is, the market imperfections will lead investors to prefer corporate debt to debt undertaken on personal account, and investors will therefore require, *ceteris paribus*, a lower expected rate of return on investments in levered firms. If this is the

[60] The following is a sampling of recent empirical studies, which contain references to earlier studies: Miller and Modigliani [30]; the "comments" on this piece [8], [17], and [42]; and Brigham and Gordon [7]; but see also Elton and Gruber [10], Sarma and Rao [43], and Litzenberger and Rao [26].

[61] For example, AT&T relied almost exclusively on debt for new external financing during the period 1967–1971. The effect was to shift its ratio of debt to total (book) capitalization from 33 to 45 percent. This was during a period of very heavy requirements for external finance. See Scanlon [54].

case, it is desirable for utilities to provide corporate leverage, since investors will thereby consider themselves better off. The trouble is that we do not know how strong investors' preference for corporate vs. personal leverage really is, if indeed this preference exists at all.

Thus, on purely economic grounds, the argument for regulating capital structure seems weak at best. About all that can be said is that utilities ought not to borrow so much that their solvency is endangered.

□ **Some additional considerations.** The alert reader will have noticed two important differences between the overall cost of capital, as given by equation (18), and the procedure actually used by regulatory bodies in arriving at an overall rate of return allowance.[62] The differences are that

(1) Market value weights are used in equation (18), whereas book value weights are used in practice, and

(2) Embedded debt costs are used in practice.

What does finance theory say about the effects of these practices?

Clearly, the fact that the cost of capital can be applied to a book value rate base does not mean that book weights should be used in measuring it. The definition of the cost of capital in terms of investors' opportunity costs definitely implies that market value weights should be used.

This is not the whole story, however. Suppose Utility X is partly debt financed. Its regulators estimate ρ as 10 percent and therefore set X's prices so that the firm can expect to earn 10 percent on its book value rate base. X's stock sells for $100 per share after all this is done. Now suppose that interest rates rise by 2 percent, and the firm's overall cost of capital rises from 10 to 12 percent. This leads to another rate hearing in which the utility is allowed 12 percent rather than 10.

Given the regulators' response, the increase in interest rates will not affect the total market value of the firm, $V = D + E$. However, bondholders will suffer a capital loss, which implies that shareholders will receive a capital gain. The rise in interest rates will lead to a capital gain on the initial share price of $100. Conversely, if interest rates fall, bondholders will gain at the expense of stockholders.

Now, suppose that regulators wish to prevent stockholders from gaining when interest rates rise, and also wish to protect them from loss when interest rates fall. The way to do this is by allowing the firm to earn

(1) Its actual embedded interest cost, plus

(2) Equity earnings equal to the cost of equity capital times the book value of equity.

Under this procedure the overall rate of return will be a weighted average of embedded debt costs and the cost of equity capital, using book weights.

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[62] See p. 61 *infra.*

To summarize, a regulatory strategy based on current debt costs requires market weights to compute the overall cost of capital. A strategy based on embedded debt costs requires use of book weights to determine the desired rate of return allowance. In general, the desired rate of return allowance in the latter case will not equal the overall cost of capital; that is, it will not generally reflect the current opportunity cost of investing in the firm's assets.

It is probably simpler, conceptually, to forget about embedded debt costs and simply use current borrowing costs. However, it is not necessarily illogical to use embedded costs. In fact, if there is no regulatory lag the use of embedded costs is generally consistent with the principle that utilities ought to expect to earn the cost of capital on new investment.[63] If utilities could change their rates automatically any time their embedded debt cost changed, then the rate of return earned on new investment would always reflect the actual current cost of any debt financing associated with the new investment.

But suppose there is a lag. Then if interest costs rise above embedded costs, a utility's rate of return on new investment will tend to be less than the cost of capital. The converse occurs when interest rates fall.

Conclusions

The use of embedded debt costs and book weights is not the most logical procedure. It seems simpler to rely on market weights and current interest costs, particularly when there is conscious use of regulatory lag. However, the straightforward approach *cum* lag is not necessarily incompatible with embedded debt costs and book weights, since the approach can be restricted to the equity component of utility capitalization. However, if the difference between current and embedded costs leads to a substantial violation of the principle that utilities ought to expect to earn the cost of capital in new investment, then an *ex ante* adjustment should be made.

10. Conclusions

■ This paper was motivated by dissatisfaction with the traditional interpretation of the comparable earnings standard, and by the hope that regulation could be made more effective by greater reliance on finance theory. Specifically, finance theory suggests that the comparable earnings standard should be defined in terms of investors' opportunity costs—i.e., in terms of utilities' costs of capital. Thus the paper is addressed to the question of whether regulation can or should be based on finance theory and the cost of capital concept. As we have seen, the search for an answer to this question requires consideration of a wide variety of topics in finance and the law and economics of regulation.

Is it in fact reasonable to base rate of return regulation on finance theory? It seems to me that the answer is a tentative yes. It is

[63] The timing of the change to current interest rates and market weights is a delicate matter. As this is written, current interest costs are substantially (1.5 percent or more) above embedded costs. A switch at this time would lead to a substantial capital gain for utility investors, financed by a one-time price increase. This raises problems of equity (to say nothing of politics), because it results from a change in the rules and is not a consequence of the regulatory process as consumers or investors have understood it.

tentative because there are difficulties (though the difficulties are often shared by other approaches to regulation) and because it is always possible that this paper will be made moot or obsolete by future developments in law, economics, or the conditions facing regulated firms.

Nevertheless there is a strong positive case to be made. I will close by summarizing it briefly:

(1) Regulation is usually regarded as a substitute for competition. If the definition of "fair return" is based on the theory of competitive markets, then regulation should assure that the average expected rate of return on new utility investment is equal to the utility's cost of capital. This is the ultimate justification for basing rate of return regulation on finance theory.

(2) This principle is consistent with the comparable earnings standard—in fact, more directly consistent than the traditional interpretation.

(3) There are many ways in which the principle can be implemented. Only the most obvious, "straightforward" approach was investigated here. But this approach is logically sound and practical. By and large, the objections to straightforward approaches can be answered satisfactorily.

(4) The straightforward approach is amenable to conscious use of regulatory lag. This does not make the approach more or less fair, but it does create stronger incentives for efficiency.

(5) The cost of capital is not directly observable, since it is defined in terms of investors' expected rates of return. At the present state of the art any estimate is part judgment. However, plausible estimates can be obtained, and the need for judgment is not evidently greater when regulation is based on finance theory rather than on traditional procedures.

The straightforward approach *cum* lag is not the final answer. It is only one of many ways to implement the principle that a utility ought to be able to expect to earn its cost of capital on new investment. Probably some of the other ways are better; it is hard to believe that the usual book value rate base could not be improved upon, for example. As a matter of fact, the whole existing framework of rate of return regulation, which was taken as given for purposes of this paper, may not be best. But all of this awaits further work.

References

1. AVERCH, H. and JOHNSON, L. L. "Behavior of the Firm Under Regulatory Constraint." *The American Economic Review*, Vol. 52, No. 5 (December 1969), pp. 1062–69.
2. BAILEY, E. E. and COLEMAN, R. D. "The Effect of Lagged Regulation in the Averch-Johnson Model." *The Bell Journal of Economics and Management Science*, Vol. 2, No. 1 (Spring 1971), pp. 278–92.
3. BAUMOL, W. J. "Reasonable Rules for Rate Regulation: Plausible Policies for an Imperfect World," in *The Crisis of the Regulatory Commissions*, P. W. MacAvoy, ed., New York: W. W. Norton and Co., 1970.
4. ———, and KLEVORICK, A. K. "Input Choices and Rate of Return Regulation: An Overview of the Discussion." *The Bell Journal of Economics and Management Science*, Vol. 1, No. 2 (Autumn 1970), pp. 162–90.

5. BAXTER, N. D. "Leverage, Risk of Ruin and the Cost of Capital." *Journal of Finance*, Vol. 22, No. 4 (September 1967), pp. 385–404.
6. BLACK, F. and SCHOLES, M. "Dividend Yields and Common Stock Returns: A New Methodology." Unpublished Working Paper, Sloan School of Management, Massachusetts Institute of Technology, 1971.
7. BRIGHAM, E. and GORDON, M. J. "Leverage, Dividend Policy and the Cost of Capital." *Journal of Finance*, Vol. 23, No. 1 (March 1968), pp. 85–104.
8. CROCKETT, J. and FRIEND, I. "Some Estimates of the Cost of Capital to the Electric Utility Industry 1954–57: Comment." *The American Economic Review*, Vol. 59, No. 5 (December 1967), pp. 1258–67.
9. DURAND, D. "The Cost of Capital, Corporation Finance, and the Theory of Investment: Comment." *The American Economic Review*, Vol. 49, No. 4 (September 1959), pp. 639–55.
10. ELTON, E. J. and GRUBER, M. J. "Valuation and the Cost of Capital in Regulated Industries." *Journal of Finance*, Vol. 26, No. 3 (June 1971), pp. 661–70.
11. EVANS, J. L. and ARCHER, S. H. "Diversification and the Reduction of Dispersion: An Empirical Analysis." *Journal of Finance*, Vol. 23, No. 5 (December 1968), pp. 761–67.
12. FAMA, E. F. "Efficient Capital Markets: A Review of Theory and Empirical Work." *Journal of Finance*, Vol. 25, No. 2 (May 1970), pp. 383–417.
13. FISHER, L. and LORIE, J. H. "Rates of Return on Investments in Common Stock: The Year-by-Year Record, 1926–65." *Journal of Business*, Vol. 41, No. 3 (July 1968), pp. 291–316.
14. FRIEND, I. and BLUME, M. "Measurement of Portfolio Performance Under Uncertainty." *The American Economic Review*, Vol. 60. No. 4 (September 1970), pp. 561–75.
15. FRIEND, I. and PUCKETT, M. "Dividends and Stock Prices." *The American Economic Review*, Vol. 54, No. 4 (September 1964), pp. 656–82.
16. GORDON, M. J. *The Investment, Financing and Valuation of the Corporation.* Homewood, Illinois: Richard D. Irwin, Inc., 1962.
17. ———. "Some Estimates of the Cost of Capital to the Electric Utility Industry 1954–57: Comment." *The American Economic Review*, Vol. 57, No. 5 (December 1967), pp. 1267–78.
18. HAMADA, R. J. "The Effects of Leverage and Corporate Taxes on the Shareholders of Public Utilities," in *Rate of Return Under Regulation: New Directions and Perspectives*, H. M. Trebing and R. H. Howard, eds., East Lansing Michigan: Institute of Public Utilities, Michigan State University, 1969.
19. – "Portfolio Analysis, Market Equilibrium and Corporate Finance." *Journal of Finance*, Vol. 24, No. 1 (March 1969), pp. 13–32.
20. JENSEN, M., ed. *Studies in the Theory of Capital Markets.* New York: Praeger Publishers, 1972.
21. KLEVORICK, A. K. "The 'Optimal' Fair Rate of Return." *The Bell Journal of Economics and Management Science*, Vol. 2, No. 1 (Spring 1971), pp. 122–53.
22. LEVENTHAL, H. "Vitality of the Comparable Earnings Standard for Regulation of Utilities in a Growth Economy." *Yale Law Journal*, Vol. 74, No. 6 (May 1965), pp. 989–1010.
23. LINTNER, J. "Expectations, Mergers and Equilibrium in Perfectly Competitive Securities Markets." *The American Economic Review*, Vol. 61, No. 2 (May 1971), pp. 101–11 .
24. ———. "Security Prices, Risk and Maximal Gains from Diversification." *Journal of Finance*, Vol. 20, No. 5 (December 1965), pp. 587–613.
25. ———. "The Valuation of Risk Assets and the Selection of Risky Investments in Stock Portfolios and Capital Budgets." *The Review of Economics and Statistics*, Vol. 47, No. 1 (February 1965), pp. 13–37.
26. LITZENBERGER, R. L. and RAO, C. U. "Estimates of the Marginal Rates of Time Preference and Average Risk Aversion of Investors in Electric Utility Shares: 1960–66." *The Bell Journal of Economics and Management Science*, Vol. 2, No. 1 (Spring 1971), p. 265–77.
27. MCDONALD, J. G. "Required Return on Public Utility Equities: A National and Regional Analysis: 1958–1969." *The Bell Journal of Economics and Management Science*, Vol. 2, No. 1 (Autumn 1971), pp. 503–14.
28. MARKOWITZ, H. "Portfolio Selection." *Journal of Finance*, Vol. 7, No. 1 (March 1952), pp. 77–91.

29. ———. *Portfolio Selection: Efficient Diversification of Investments.* New York: John Wiley and Sons, Inc., 1959.
30. MILLER, M. and MODIGLIANI, F. "Some Estimates of the Cost of Capital to the Electric Utility Industry: 1954–57." *The American Economic Review*, Vol. 56, No. 3 (June 1966), pp. 333–91.
31. MODIGLIANI, F. and MILLER, M. H. "Corporate Income Taxes and the Cost of Capital: A Correction." *The American Economic Review*, Vol. 53, No. 3 (June 1963), pp. 433–43.
32. ———. "The Cost of Capital, Corporation Finance and the Theory of Investment." *The American Economic Review*, Vol. 48, No. 3 (June 1958), pp. 261–97.
33. MORTON, W. A. "Guides to a Fair Rate of Return." *Public Utilities Fortnightly*, Vol. 86, No. 2 (July 2, 1970), pp. 17–30.
34. ———. "Rate of Return and the Value of Money in Public Utilities." *Land Economics*, Vol. 28 , No. 2 (May 1952), pp. 91–131.
35. MOSSIN, J. "Equilibrium in a Capital Asset Market." *Econometrica*, Vol. 34, No. 4 (October 1966), pp. 768–83.
36. MYERS, S. C. "Procedures for Capital Budgeting Under Uncertainty." *Industrial Management Review*, Vol. 9, No. 2 (Spring 1968), pp. 1–20.
37. NEW YORK PUBLIC SERVICE COMMISSION. *New York Telephone Co.* Prepared Testimony, I. Friend. 1971.
38. POSNER, R. A., "Taxation by Regulation." *The Bell Journal of Economics and Management Science*, Vol. 2, No. 1 (Spring 1971), pp. 22–50.
39. RAO, C. U. and LITZENBERGER, R. H. "Leverage and the Cost of Capital in a Less Developed Capital Market: Comment." *Journal of Finance*, Vol. 26, No. 3 (June 1971), pp. 77–82.
40. ROBICHEK, A. A. and MYERS, S. C. "Conceptual Problems in the Use of Risk-Adjusted Discount Rates." *Journal of Finance*, Vol. 21, No. 5 (December 1966), pp. 727–30.
41. ———. "Problems in the Theory of Optimal Capital Structure." *Journal of Financial and Quantitative Analysis*, Vol. 1, No. 2 (June 1966), pp. 1–35.
42. ROBICHEK, A. A., MCDONALD, J. G., and HIGGINS, R. C. "Some Estimates of the Cost of Capital to the Electric Utility Industry 1954–57: Comment." *The American Economic Review*, Vol. 57, No. 5 (December 1967), pp. 1278–88.
43. SARNA, L. V. L. N. and RAO, K. S. H. "Leverage and the Value of the Firm." *Journal of Finance*, Vol. 24, No. 4 (September 1969), pp. 673–77.
44. SHARPE, W. F. "Capital Asset Prices: A Theory of Market Equilibrium Under Conditions of Risk." *Journal of Finance*, Vol. 19, No. 4 (September 1964), pp. 425–42.
45. ———. *Portfolio Theory and Capital Markets.* New York: McGraw-Hill Book Co., 1970.
46. SOLOMON, E. "Alternative Rate of Return Concepts and Their Implications for Utility Regulation." *The Bell Journal of Economics and Management Science*, Vol. 1, No. 1 (Spring 1970), pp. 65–81.
47. ———, and LAYA, J. E. "Measurement of Company Profitability: Some Systematic Errors in the Accounting Rate of Return," in *Financial Research and Management Decisions*, A. A. Robichek, ed., New York: John Wiley and Sons, Inc., 1967.
48. STIGLER, G. J. "The Theory of Economic Regulation." *The Bell Journal of Economics and Management Science*, Vol. 2, No. 1 (Spring 1971), pp. 3–21.
49. TRAPNELL, G. R. "Relationship of the Book Rate of Return on Investment to the Internal Rate of Return on the Investment and Implications for Utility Regulation." Unpublished Manuscript. Staff Paper 4, Office of the Actuary, Social Security Administration, 1971.
50. U. S. FEDERAL COMMUNICATIONS COMMISSION. *American Telephone and Telegraph Co.* Prepared Testimony, I. Friend. F.C.C. Docket 16258, 1966.
51. ———. *American Telephone and Telegraph Co.* Prepared Testimony, M. J. Gordon. F.C.C. Docket 16258, 1966.
52. ———. *American Telephone and Telegraph Co.* Prepared Testimony, D. Kosh. F.C.C. Docket 19129, 1971.
53. ———. *American Telephone and Telegraph Co.* Prepared Testimony, S. C. Myers. F.C.C. Docket 19129, 1971.
54. ———. *American Telephone and Telegraph Co.* Prepared Testimony, J. J. Scanlon. F.C.C. Docket 19129, 1971.

55. ———. *Communications Satellite Corp.* Prepared Testimony, E. F. Brigham. F.C.C. Docket 16070, 1971.
56. U. S. FEDERAL POWER COMMISSION. *Area Rate Proceeding* (Offshore Southern Louisiana . . .) *et al.* Prepared Testimony, E. Solomon. F.P.C. Docket AR 69–1 et al., 1969.
57. ———. *Consolidated Gas Supply Corp.* Prepared Testimony, H. G. Roseman. F.P.C. Docket RP69–19, 1969.
58. ———. "Opinion and Order Determining Fair Rate of Return." F.P.C. Opinion No. 579, *Pacific Gas Transmission Corp*, F.P.C. Docket RP70–4 1970.
59. ———. *Texas Eastern Transmission Corp.* Initial Brief of Commission Staff. F.P.C. Docket RP69–13, 1969.
60. ———. *Texas Eastern Transmission Corp.* Prepared Rebuttal Testimony, E. Solomon. F.P.C. Docket RP69–13, 1969.
61. ———. *Texas Eastern Transmission Corp.* Prepared Testimony, S. C. Myers. F.P.C. Docket RP69–13, 1969.
62. WILLIAMS, J. B. *The Theory of Investment Value.* Amsterdam: North-Holland Publishing Co., 1968.

Alternative Cost-of-Capital Concepts in Regulation

Basil L. Copeland, Jr.

Harry Trebing [1974] recently suggested that the greatest failing of public utility regulation has been its inability to accomodate change. An opportunity for change presented itself a generation ago when the U.S. Supreme Court released regulation from the burden of "fair value."[1] But rather than avail itself of the opportunity presented, regulation allowed the old debate on fair value to become a new debate on fair return. If once you could always find an engineer somewhere to testify that the fair value rate base was one figure rather than some other, you can now always find an economist somewhere who will testify that the fair return is some figure rather than another. The inability of expert witnesses to agree either as to the methods that ought to be employed to determine the allowable return, or as to the results that follow from the application of different methods, has created a situation where it is now a convention for regulators to assume that the fair or required return on equity is a "subjective factor" that cannot be determined without the application of "informed judgment."[2] The ability of expert witnesses to fall back on their "informed judgment" makes it difficult to assess the usefulness of their testimony and assures that the recommended rates of return proffered by the various witnesses in a regulatory proceeding will be bounded only by the limits to their imagination.

The present consensus in regulation supports the view that the *cost of capital* is an appropriate standard of fair return for public utilities. There can be little comfort in such consensus since the issues that matter in a practical sense are disputed. The present state of affairs can be attributed in a very general way to two developments. The first, mentioned here only in passing, concerns the substitution of subjectivity for objectivity in the empirical procedures used to determine a fair return, once the conceptual framework has been established. According to Popper, the

> . . . way in which knowledge progresses . . . is by unjustified (and unjustifiable) anticipations, by guesses, by tentative solutions to our problems, by *conjectures*. These conjectures are controlled by criticism; that is by attempted *refutations*, which include severely critical tests.[3]

Methodologically, even a *guess* at what is a fair return is permissible if a serious effort is made to search for evidence that will refute it, although a practical imple-

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[1] *F.P.C.* v. *Hope Nat. Gas Co.*, 320 U.S. 591 (1944).

[2] In *Gen. Teleph. of the Southeast* v. *P.U.C.*, 7 PUR 4th 273 (1974), the Tennessee Public Service Commission said: "The cost of equity is a subjective factor and cannot be determined by precise mathematical formula. A determination of the cost of equity capital requires the application of informed judgment (at 286)." This attitude is not at all uncommon among regulators.

[3] See Popper [1968, p. vii].

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mentation of Popper's Principle of Falsifiability in regulation seems to require a theory of return that produces testable (i.e., falsifiable) propositions. Rarely will one ever encounter rate-of-return testimony in which the witness employs a truly testable theory of return. What one *will* encounter, however, and quite often, is testimony in which the witness describes a search for *confirming* evidence and, having found it, proffers it as an evidentiary basis for his rate-of-return recommendation. But as Popper says, you can almost always find confirmations of every theory if that is what you are looking for. The absence of a critical attitude among cost-of-capital witnesses accounts in no small measure for some of the confusion surrounding the issue of rate of return in regulation.

The second development, which is the topic of discussion in this paper, concerns the use of alternative *concepts* of the cost of capital in regulation. No effort will be made to assess all of the theories that have ever been advanced as a basis for determining the cost of capital for public utilities. The arcane theories are safely ignored and the only cost-of-capital concepts economists need to take seriously are the cost-of-capital concepts regulators take seriously. At the present time two cost-of-capital concepts are more widely used than any other in regulation as a basis for determining the cost of equity capital. One of these is the *discounted cash flow* (DCF) concept which is based on a dividend valuation model of common stock prices. The application of DCF in regulation is essentially an effort to estimate the equilibrium expected return (yield) on public utility shares. This yield is then taken to be the return equity investors require before they will commit their funds to an investment in the equity of the particular firm under consideration. The other cost-of-capital concept widely used in regulation is the *comparable earnings* concept. The economic rationale for comparable earnings as a cost-of-capital concept presumes that investors have the opportunity to invest in direct investment and that the earnings on book value of alternative comparable investment opportunities is therefore properly considered to be the opportunity cost of capital.[4] According to the National Association of Regulatory and Utility Commissioners (NARUC) more than half of the state commissions presently rely upon or accept comparable earnings as a method of determining the cost of equity for public utilities.[5] Only about one-third of the state commissions have indicated an acceptance of DCF.

A critical analysis of the use of comparable earnings and DCF in regulation is important for several reasons. First of all, a substantial portion of the total equity capital presently invested in U.S. corporations is invested in the equity of public utilities.[6] Regulatory policies with respect to return on equity can consequently have a significant impact upon the distribution of income and the allocation of capital in the U.S. economy. Furthermore, the choice of one concept or the other is not a moot question because DCF tends rather consistently to produce a lower estimate of the required return than the actual earned returns of alternative comparable investment oppor-

[4] Throughout this paper the term "direct investment" refers to the possibility of directly employing the factors of production, as opposed to purchasing the shares of a firm which in turn employs the factors of production.

[5] The source of this information is NARUC's *1975 Annual Report on Utility and Carrier Regulation*.

[6] According to Citibank's *Monthly Economic Letter*, April 1977, of a total of $633.27 billion of equity capital invested in the manufacturing, nonfinancial, and financial sectors of the economy, $116.52 billion is invested in public utilities. This figure does not include investment in the regulated sector of the transportation industry.

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tunities.[7] It is necessary to determine the reason for this difference if regulation is to serve the public interest. Too high a return will only result in unnecessary investment and serve to aggravate the effect of rising utility costs on the cost of living. But too low a return will be no less disastrous to the public welfare if it results in inadequate investment to serve the public need for future generating capacity or the development of future gas supplies. The subject is also deserving of attention because the conclusions reported here do not speak well of the present effectiveness of rate-of-return regulation in serving the public interest. The comparable earnings approach, which is more widely used and relied upon than any other method in regulation, suffers from a number of conceptual and methodological infirmities that render it inappropriate as a regulatory tool for determining the cost of equity. The body of the paper that follows begins with a review and critique of the comparable earnings concept as it is applied in regulation, and argues, among other things, that the comparable earnings approach violates a fundamental marginal condition necessary to achieve efficiency in the allocation of capital, and generally results in an overestimate of the cost of equity. The paper then reviews the corresponding strengths and weaknesses of the DCF approach and suggests that DCF embodies a proper concept of return at the margin that makes it preferable to comparable earnings as a regulatory tool for determining the cost of equity for public utilities.

THE COMPARABLE EARNINGS CONCEPT

The origins of comparable earnings analysis in regulation are often traced to decisions of the U.S. Supreme Court in the cases of *Bluefield Water Works & Improvement Co.* v. *Public Service Commission of West Virginia*, 262 U.S. 679 (1923), and *Federal Power Commission* v. *Hope Natural Gas Co.*, 320 U.S. 591 (1944).[8] In the *Hope* decision the Court ruled that

> The rate-making process under the Act, i.e., the fixing of "just and reasonable" rates, involves a balancing of the investor and the consumer interests . . . . From the investor or company point of view it is important that there be enough revenue not only for operating expenses but also for the capital costs of the business. These include service on the debt and dividends on the stock . . . . By that standard the return to the equity owner should be commensurate with returns on investments in other enterprises having corresponding risks. That return, moreover, should be sufficient to assure confidence in the financial integrity of the enterprise, so as to maintain its credit and to attract capital . . . . The conditions under which more or less might be allowed are not important here. Nor is it important to this case to determine the various permissible ways in which any rate base on which the return is computed might be arrived at. For we are of the view that the end result in this case cannot be condemned under the Act as unjust and unreasonable from the investor or company viewpoint.[9]

The phrase in *Hope* cited most often to support the comparable earnings concept of fair return is the phrase "the return to the equity owner should be commensurate with returns on investments in other enterprises having corresponding risks." Cost-of-capital witnesses (and regulators) often take the Court's language to mean that a comparable earnings approach to

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[7] For evidence of this fact, see Morton [1970*a*], who cites a study by Ezra Solomon. This writer's experience in rate-of-return regulation will corroborate the finding that comparable earnings estimates of the cost of equity are generally higher than DCF estimates. In this paper the author offers an explanation for this phenomenon.

[8] Kahn [1970, p. 52, note 77], for example, traces the comparable earnings standard to the language of the Court in the *Bluefield* and *Hope* cases.

[9] *F.P.C.* v. *Hope Natural Gas Co.*, 320 U.S. 591 (1944) at 603.

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fair return is *prescribed* by law.[10] But as Stewart Myers [1972*a*] once noted, the proponents of the comparable earnings approach in regulation interpret the language of the Court in a particular way, as if to say that: "The return to the equity owner should be commensurate with [*recent book*] returns on [*past*] investments [*made by*] other enterprises having corresponding risks."[11] Before reviewing the conceptual and methodological difficulties inherent in this particular view of fair return, some comment is in order as to whether this particular view of fair return was actually ever *prescribed* by the Court.

The legal and economic implications of *Hope* cannot reasonably be inferred apart from the historic context leading up to the decision. During the half-century preceding *Hope* regulation labored under the perverse burden of *Smythe* v. *Ames*, 169 U.S. 466 (1898). Under the rule of *Smythe* v. *Ames* regulated firms were considered to be entitled to a "fair return" on "fair value." The "fair value" concept was challenged by the institutionalists as an elusive, subjective, and improper standard of value and there developed, under their tutelage, a growing recognition of the superiority of net original cost as a measure of the value of investment in regulated firms. The central issue in the *Hope* case was the Federal Power Commission's use of original cost as a rate base rather than fair value, and the *Hope* decision became a landmark because of the Court's refusal to insist on the use of a fair value rate base. A return was fair, the Court decided, if it provided a return sufficient to cover the operating expenses and capital costs of the business, and it made little difference to the Court if by this standard the firm earned a large return on a small rate base or a small return on a large rate base.[12]

The real meaning of *Hope* was soon lost on everyone. After meandering through a maze of meaningless exercises intended to establish the "true" value of the rate base the Court had finally realized the error of anything other than a pragmatic standard of truth. A careful reading of *Hope* suggests that there remained, once the fair value doctrine was struck down, a *single* standard of fair return: financial viability. No return which enables a firm "to operate successfully, to maintain its integrity, to attract capital, and to compensate its investors for the risks assumed" would henceforth be condemned as unjust, unreasonable, or unfair. The standard of fair return that remained was thus pragmatic and instrumental, and any particular allowed return could now be judged by its effectiveness in action: an allowed return on equity was fair if it maintained the financial viability of the firm and was not, if it did not. Just a year later, in *Panhandle Eastern Pipe Line Co.* v. *Federal Power Commission*, 324 U.S. 635 (1945), the Court said: "We are unable to say . . . that the

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[10] Morton has said: "It is a fact demonstrable from a great deal of testimony that some of those who have used some or all of the four fallacious methods just described, have also rejected the *comparative earnings method prescribed by the* courts [emphasis supplied—B.C.]. In doing this, they have openly admitted that they were not being guided by court decisions. . ." [1970*b*, p. 28]. As noted in the paragraphs to follow, Morton's interpretation of the law is somewhat in error. The Court never prescribed the method of determining the allowable return. The ruling principles of fair return set forth in the *Hope* decision concern the *effect* of the allowed return on the financial well-being of the regulated firm, and not how the return was determined.

[11] Myers [1972, p. 62].

[12] In the *Hope* decision the Court said: "Rates which enable the company to operate successfully, to maintain its financial integrity, to attract capital, and to compensate its investors for the risks assumed certainly cannot be condemned as invalid, even though they might produce only a meager return on the so-called 'fair value' rate base" (*F.P.C.* v. *Hope Natural Gas Co.*, 320 U.S. 591 (1944) at 605).

[13] *Panhandle Eastern Pipe Line Co.* v. *F.P.C.*, 324 U.S. 635 (1945) at 650.

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return is not commonsurate with the risks, that confidence in petitioner's financial integrity has been impaired, or that petitioner's ability to attract capital, to maintain its credit, and to operate successfully and efficiently has been impeded."[13] Since there was no evidence to suggest that the allowed return had in any way impaired the financial integrity of the enterprise, the Court applied the pragmatic standard of *Hope* and ruled that the allowed return was thus fair and reasonable.

Hope was an ambitious effort on the part of the Court to release regulation from the subjectivism inherent in the determination of fair return on fair value by substituting a pragmatic standard of fair return that looked to the effect or end-result of regulatory decision-making as the test of whether a regulatory decision was fair and reasonable. Unfortunately, the Court did not foresee that its decision would be wrested from its historic context to impose a set of standards on regulation no less subjective and unmanageable than the standards of *Smythe* v. *Ames*.[14] But in the final analysis the rule of law on this issue seems clear. The constitutional guarantee of due process does not prescribe or require the use of any particular method to determine the fair return but it does *proscribe* regulatory decisions which are arbitrary, capricious, and unsupported by substantial evidence. Since there is nothing in the law to give favor to one concept of the cost of capital or fair rate of return over any other—the law is only concerned with the end result of any allowed return on the financial viability of the enterprise, and not with the academic subtleties that may cause expert witnesses to prefer one approach over another—the law cannot be used to justify preference for the comparable earnings concept in the absence of any compelling economic argument in its favor. With this in mind we may now proceed to a discussion of the conceptual and methodological problems of comparable earnings as a cost-of-capital concept in regulation.

The comparable earnings method of analysis generally consists of the selection of a sample of firms purported to be comparable in risk to the firm under regulatory review. The mean return on book equity for the group is then taken to be a measure of required return for the applicant firm, i.e., its cost of equity. There is a temptation on the part of some to refer to this as an "opportunity cost" approach.[15] The thought seems to be

[14] See Leventhal [1965] and Roseman [1970] for examples of authors who attempt to distinguish between comparable earnings and capital attraction as separate (and sometimes conflicting) standards of fair return. In view of the present tendency to make this distinction, the predictions of Ben Lewis [1966] in the following memorable quotation seem painfully prescient; speaking of the "several" standards of fair return, he said:

> All of these, taken together, constitute a direct, functional workable approach. What shall we do with it? I suggest that we follow it, simply, positively and with determined purpose. I must warn you that there is reason to fear that we will not proceed in this fashion. Instead, as we begin in sheer disgust to move away from the debacle of valuation, we will probably substitute a new form of Roman holiday—long-drawn-out, costly, confusing, expert-contrived presentations, in which the simple directions of the *Hope* and *Bluefield* cases are turned into veritable witches' brews of statistical elaboration and manipulation. I have recently been witness to such an exercise—an attempt to establish "comparability" between utilities and certain industrials. It was a fearsome business—a scientific facade, and a parade of evidence and calculations leading to the "establishment" of predetermined conclusions, which the exercise permitted but certainly did not establish. We do not need to do this sort of thing to regulation; we do not need to do it to ourselves. The behavior of investors will tell us, day by day, all we need to know about "comparability." If, by the grace of God, we manage to free ourselves from the clutches of calculations to determine "scientifically" and "expertly" the substantive content of each of the *Hope* and *Bluefield* criteria as independent, competing variables, we will deserve the fate that will certainly overtake us—the demise of regulation as an institution, and the sooner the better [Lewis 1966, pp. 242, 243].

[15] Commenting on a witness's characterization of his comparable earnings analysis as an opportunity cost approach the Iowa State Commerce Commission has said, "[His] application of the opportunity cost method ignores the marketplace and is founded on the myth that earnings on book value can be used as the alternative investment opportunities. An investor cannot normally purchase a stock at book value, he must purchase at the market price" (*Re Northwestern Bell Teleph. Co.*, 97 PUR 3d 444, at 459).

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that by investing in the applicant firm the investors have foregone the opportunity to earn the return earned by the comparable firms. But it is not clear that the investors in the applicant firm would necessarily relish the opportunity to earn a similar return; what if the comparable firms are earning less than the cost of equity? As a way around this problem some witnesses are careful to select only those firms with "adequate returns."[16] The logical inconsistency of this practice apparently escapes them. The purpose of comparable earnings analysis is to *determine* an adequate return and it is difficult to imagine how anyone can employ the findings of a study as an a priori criterion for the selection of the data that goes into the study! Where this happens it is obvious that the end result of the study is a foregone conclusion consistent with the analyst's subjective conception of what he thinks the return ought to be.

As an alternative to the selection of a specific sample that may be criticized for omitting firms with low returns, some witnesses use the return earned on broad market aggregates such as Standard & Poor's 425 as a measure of the opportunity cost of capital for public utilities. This procedure avoids the problem of arbitrarily omitting certain firms from the analysis, and has a certain conceptual appeal for some (to be discussed later), but presents problems of its own. In the first place, there is the question of whether the earned rate of return on a broad market aggregate is an accurate reflection of the economic return to capital. Solomon [1970] argues that accounting rates of return will tend to overestimate the economic or true return on capital. Stauffer [1971] counters with an argument that accounting rates of return may underestimate the economic return on capital, but he does acknowledge that accounting rates of return in some industries (e.g., the pharmaceutical industry) overstate considerably the economic return on capital, and to a lesser extent in some other industries (e.g., the chemical industry and the nonferrous metals industry). A slightly different attack on the reliability of accounting rates of return is offered by Ayanian [1975], Bloch [1974], and Clarkson [1977] who argue that accounting rates of return are biased upward in many industries by the practice of expensing outlays on advertising, research, and development.[17] And apart from these observations we should expect the average earned return on market aggregates to overstate the average return to capital in a competitive market environment because the aggregates include survivors only and exclude firms that have gone bankrupt. In the light of these comments, it seems clear that accounting rates of return on market aggregates are generally unreliable and are most likely biased upward.

Apart from the problem of measurement inherent in the use of earned returns on market aggregates, there is the nagging problem of comparability. Even if one somehow succeeds in determining the economic return on book equity for a broad market aggregate, it does not neces-

[16] See, for example, the testimony of John K. Langum [1975].

[17] In the foreword to Clarkson's [1977] book, Brozen quite succinctly states the problem encountered when measuring accounting rates of return for industrial and manufacturing firms:

> Accounting rates of return are generally biased upward because accounting principles are "conservative." That is, accountants usually charge to current expense intangible investments such as organization costs, costs of establishing trade connections and of breaking in equipment, expenditures on recruiting, selecting, and training personnel, outlays on promotion (including advertising), and outlays on research and development. All these activities produce future income and therefore create economic assets. But accountants do not record such "intangible" assets, with the result that the rate of return obtained by expressing income as a percentage of recorded assets is overstated because the cost of assets is understated [Brozen 1977, p. 7]

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sarily follow that this is a proper standard of return for public utilities. The proper return for a regulated firm is one that is "commensurate with the returns on investments in other enterprises having *corresponding* risks." It has long been a convention in regulation to think that investments in the regulated sector are exposed to less risk than investments in the competitive sector.[18] But only recently have developments in the theory of risk measurement provided economists with a conceptual basis for measuring risk. Sharpe [1964], Lintner [1965], and Mossin [1966] have shown that the equilibrium expected return on a capital asset will be a linear function of the systematic risk of the asset where systematic risk is measured by the covariance of the asset's returns with the returns to a "market" portfolio consisting of all risky assets, divided by the variance of the returns to the market portfolio.[19] Quantitative estimates of systematic risk for common stocks are obtained by regressing holding period returns for the stocks on the market returns. The regression coefficient, or "beta", is an estimate of systematic risk.[20]

The use of beta as a measure of risk in a regulatory proceeding has been criticized by Breen and Lerner [1972] and defended by Myers [1972*b*]. A common concern is whether beta is a reliable measure of risk for *individual* firms. Blume [1971] and Levy [1971] have shown that individual betas estimated for relatively short holding periods tend to be unstable. But there are methods of adjusting betas for this instability.[21] Problems relating to the measurement and use of beta are not formidable and should not be exaggerated to the point where the positive value of beta as a measure of risk is ignored. Melicher [1975] has shown that there is an empirical link between systematic risk and financial characteristics for regulated firms, corroborating a similar finding for broader groups of firms by Beaver, Kettler, and Scholes [1970] and Beaver and Manegold [1975].[22] These findings suggest that beta is useful as an objective measure of risk for assessing the degree of comparability between utilities and nonregulated firms. This observation has a bearing on the use of market aggregates in comparable earnings studies because these aggregates are essentially identical to "the market." Since utilities with few exceptions have betas less than one, the use of the aggregates as a comparable investment opportunity is not consistent with the criteria that the allowed return be one which is "commensurate with the returns on investments in other enterprises having corresponding risks."[23]

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[18] Keynes was of this view. In *The General Theory of Employment, Interest, and Money* he said: "In the case of another important class of long-term investments, namely public utilities, a substantial proportion of the prospective yield is practically guaranteed by monopoly privileges coupled with the right to charge such rates as will provide a certain stipulated margin" [Keynes 1965, p. 163].

[19] The fundamental proposition of the capital asset pricing model is that the equilibrium expected return on a risky asset i is

$$E(R_i) = R_f + \beta_i[E(R_m) - R_f]$$

where R_f is the return on a risk-free asset, $E(R_m)$ is the expected return on the market, and β_i is $\mathrm{COV}(R_i, R_m)/\mathrm{VAR}(R_m)$. The expected return on i varies directly with its β, which is a measure of its systematic risk.

[20] Beta can be considered a measure of relative volatility, with the market beta having a value of unity. A security with a beta of 2.0 is twice as volatile as the market, and a security with a beta of 0.5 is only half as volatile as the market.

[21] Klemkosky and Martin [1975] have evaluated the various methods of adjusting betas.

[22] However, Melicher and Rush [1974] failed to establish a link between changes in betas over time and changes in financial characteristics.

[23] No effort is made in this paper to assess the use of the capital asset pricing model as a method of estimating the cost of equity in regulation because it has not (yet) been widely employed for that purpose. It is even doubtful to this writer that it can be employed to estimate the cost of equity. Application is contingent upon a

The problems discussed thus far are essentially methodological and it is not inconceivable that a comparable earnings analysis could be so constructed that the earned returns are accurately computed and the sampled firms are actually comparable in terms of market risk. There remains a conceptual problem of some significance. The proponents of the comparable earnings approach argue that the goal of regulation is to approximate in the utility industry the rate-of-return conditions effected by competition in competitive unregulated industries, and that the regulatory authorities should therefore look to the average rate of return earned in competitive unregulated industries as a benchmark or standard of fair return for the regulated firm. But the only economic rationale for using competition as a prescriptive model for regulation is to effect in the regulated sector the allocative efficiency that would exist if utilities operated in a competitive market. This implies that regulation should seek to achieve the same *marginal conditions* that exist under conditions of competition. This result is not obtained when regulators use comparable earnings as a standard of fair return.

In a competitive industry the capitalized value of old plant will tend to equal the cost of constructing and operating competitive (new) plant at current prices, and new capital will enter the industry as long as demand is sufficient to permit the new firm to earn a return equal to or greater than the cost of capital.[24] The marginal firm, which earns a return just equal to the cost of capital, is constructed and operated at current prices so its book value and market value are the same. Intramarginal firms may have capitalized values in excess of book value, and earn a return greater than the cost of capital, but the excess return is a rent that is capitalized in the value of the firm and it is not an element of opportunity cost to capital employed elsewhere: new capital cannot enter the industry and earn any more than the return earned by the marginal firm in the industry. And as long as the industry supply curve is upward sloping, it follows that the average return on investment (ARI) for the industry will exceed the marginal return on investment (MRI).

Now consider what will happen if the regulatory authorities use a competitive unregulated industry with an upward sloping supply curve as a comparable investment alternative and allow a firm under regulatory review a return on in-

proper determination of the market risk premium. So far this market risk premium has been estimated by subtracting market yields or holding period returns for a risk-free asset (Treasury Bills) from ex post market returns. The use of ex post returns to estimate yield spreads poses problems that are apparently unappreciated by those working within the CAPM paradigm. Just to take a simple example, suppose a risk-free bond with a $10 coupon is selling to yield 5%, and a risky asset with a constant dividend of $10 is selling to yield 10%. The yield spread is 5%. Now suppose the yields increase to 10% and 15%, respectively, thus maintaining the 5% yield spread. The holding period return on the risk-free bond will be −50% and the holding period return on the risky asset will be −33 1/3% for a spread of 16 2/3%. This spread of 16 2/3% in the holding period returns is not a very good estimate of the 5% yield spread! The general result is that spreads in ex post returns overestimate the yield spread when yields are rising, and underestimate the yield spread when yields are falling. Ibbotson and Sinquefield [1976] estimated a risk spread between stocks and Treasury Bills over the period 1926–1974 of about 6.1%. Since the dominant secular trend in yields over this period was upward, this ex post return spread most likely overestimates the ex ante yield spread.

[24] Fifty years ago Glaeser [1927] employed a similar argument in his critique of reproduction cost as a rate base in regulation. Anyone interested in the economics of regulation ought to read Glaeser. Much has been written on regulation since his time, but little of it constitutes an intellectual advancement over his insight into the problems and economics of regulation.

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vestment equal to the average return on investment earned by the firms in the unregulated industry. At first the use of an average return may seem "fair and reasonable" since it sets as a standard neither the most profitable return nor the least profitable return earned by the purportedly comparable firms. But since it is an average return it is higher than the return that can be earned by any firm in the industry on *new* investment. The "fairness" of the comparable earnings standard is thus illusory. In regulation the allowed return is allowed on *all* investment and there is nothing to stop the regulated firm from engaging in unnecessary investment so as to earn on new investment a higher return than is earned on new investment in the comparable unregulated industry. This breakdown in the comparable earnings standard becomes obvious once it is recognized that the standard violates a necessary marginal condition for allocative efficiency by allowing regulated firms the *average* return on investment in competitive unregulated industries rather than *marginal* return.

This, in the final analysis, is the greatest failing of the comparable earnings concept. The return earned on a broad market aggregate is likely to be biased upward, for all the reasons discussed earlier, as an indication of the average return on investment for competitive unregulated industries. Presuming these problems can be resolved, there remains the fact that the comparable earnings standard is not a measure of what *can* be earned on new investment, but of what *has been* earned on prior investment. The comparable earnings concept thus violates a marginal condition necessary to achieve for regulation the allocative efficiency that would exist under conditions of competition and fails to promote a proper allocation of capital between the regulated and unregulated sectors of the economy.

THE DISCOUNTED CASH FLOW CONCEPT

As an alternative to the comparable earnings approach, a number of commissions have accepted the discounted cash flow model as a conceptual basis for rate of return decisions. As a model of share valuation, the DCF theory was first developed by John Burr Williams [1938] and then later extended, with emphasis on its application in regulation, by Myron Gordon [1974].[25] Theoretical expositions of the model often incorporate restrictive assumptions in order to clarify the relationship between and the effect of the dividend payout rate, internal versus external financing, leverage, etc. But few assumptions are actually necessary to make the concept operationally useful. In fact, the DCF model follows from simply assuming that investors capitalize dividends expected to grow at some constant rate of growth. Whether the assumption is valid or not is a question to be answered empirically.[26] But if the assumption is valid then it follows that current share prices are equal to the current dividend divided by the difference

[25] The DCF model is widely accepted in financial management textbooks as a model of the cost of equity. See, for example, Weston and Brigham [1975]. The third edition of Weston and Brigham [1969] is more explicit in giving Gordon credit for the modern development of DCF.

[26] This writer has shown in Copeland [1977] that the DCF model implies a testable relationship between the ratio of market value to book value and the expected profit rate (return on equity). He found that the model performed well in every year except 1974. He concludes that except during periods of market panic the model is a useful representation of the share valuation process. The assumptions embodied in the model are therefore operationally useful.

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between the investor discount rate and the expected rate of growth in the dividend:

$$P = \frac{D}{k - g} \quad [1]$$

where P = the equilibrium market price per share; D = the current dividend per share; k = the investor discount rate, or cost of equity; and g = the expected rate of growth in the dividend. Rearranging [1] gives the familiar DCF identity whereby the cost of equity is inferred to be equal to the sum of the dividend yield and the expected growth rate:

$$k = D/P + g \quad [2]$$

The discounted cash flow model of the cost of equity is a model of the equilibrium expected return or yield on shares. If the expected return (current yield plus expected growth) is greater than the required return, share prices will rise and yields will fall, until equilibrium is restored. But DCF is not only a model of stock market equilibrium, it also implies equilibrium between share yields and the marginal return on direct investment. If, for example, the marginal return on direct investment is greater than the expected return on shares, there will be an incentive for investors to sell their shares, form a new company, and engage in direct investment. At the margin the return that can be earned on direct investment and the return that can be earned on shares will be equal.[27] The result of this equilibrating process is that the DCF yield on shares in a competitive unregulated industry will equal the marginal return on new investment. Since the stockholders of public utilities are always free to sell their shares and either purchase the shares of comparable unregulated enterprises, or engage in direct investment in unregulated industries of corresponding risks, the equilibrium yield on the shares of public utility stocks will tend (through the equilibrating process) to equal the equilibrium yield on shares of comparable unregulated enterprises *and* to equal the marginal return on new investment in unregulated enterprises of corresponding risks. To the extent, therefore, that one properly measures the equilibrium yield on public utility shares, this yield is the true opportunity cost of equity capital for public utilities and equals the marginal return on investments "in other enterprises having corresponding risks." So not only does DCF embody a proper concept of return at the margin, it fulfills, in a way the comparable earnings concept does not, the test of commensurate returns implied by the Supreme Court in the *Hope* case.

Despite general acceptance of DCF as a model of share yield, its use as a cost-of-capital concept in regulation has not been without resistance. The two substantive concerns with the use of DCF in regulation are in regard to: (1) the tendency of a DCF rate of return to drive share prices down to book value, and (2) the appropriateness of using a DCF rate of return with an original cost rate base during periods of inflation. No recommendation regarding the use of DCF in regulation is complete without addressing these issues.

Over an extended period of time the average ratio of market value to book value for industrial firms will tend to be

[27] This statement ignores transactions costs and market imperfections. However, there may be some difference between the marginal return on direct investment and the equilibrium yield on shares because of the greater cost of acquiring information and organizing a direct investment. But the net return on direct investment and the net return on shares will be equal. Since transactions costs for share issues are commonly taken into consideration when setting a rate of return for a public utility, the abstraction taken in the text does not affect the validity of the conclusion.

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greater than one.[28] It is not always clear to those involved in the regulatory process why utilities shouldn't be allowed returns that will produce market-to-book ratios of a similar magnitude. The confusion follows from a failure to consider why industrial market-to-book ratios are ever greater than one and to consider whether the same forces are at work in the regulated sector. Average long-run market-to-book ratios greater than one for unregulated enterprises are a consequence of the upward sloping supply curves that characterize competitive industries.[29] As noted earlier, intramarginal firms earn rents that result in capitalized values in excess of book values, but the marginal firm only earns the cost of capital and has a market-to-book ratio of one. For a regulated firm to achieve a market-to-book ratio equal to the average market-to-book ratio for competitive firms of corresponding risks it must be allowed a return equal to the *average* return on investment earned by the competitive firms. This violates the necessary marginal condition for efficiency in the regulated sector. We are back, then, to the problem that results because regulated firms are allowed the same return on all investments (ARI = MRI) while unregulated firms in competitive markets generally operate under conditions of rising supply prices (ARI > MRI). The same prescriptive standard of allocative efficiency that calls for the use of a marginal return (DCF) rather than an average return (comparable earnings) therefore implies that the proper ratio of market value to book value for regulated firms is unity.[30]

Concern about the use of a DCF rate of return with a historical cost rate base results from a failure to acknowledge the efficiency of capital markets in adjusting required rates of return to account for changes in the anticipated rate of inflation. In order to clear up the issue, imagine initial equilibrium with no expected inflation. The required return given by the DCF model, $k = D/P + g$, is an expected real return. When this return is multiplied against an original cost rate base it produces a certain dollar return which we denote R. Now consider the advent of expected inflation with prices expected to grow at a rate Δ. In a manner analogous to the Fisher effect for bonds, the required return on shares will increase to $k' = k + \Delta$. If stocks are a complete hedge against inflation, earnings and dividends will now grow at a rate $g' = g + \Delta$. The DCF yield will now be $k' = D/P + g'$, and when this return is applied against the historical cost rate base it will produce a nominal dollar return R' which has a value of R in real terms (constant dollars). The appropriateness of DCF is not altered if stocks are an incomplete hedge against inflation. In this latter case, prices will fall so that the dividend yield rises a sufficient amount to offset the failure of growth in dividends to adjust by the full amount of the expected increase in prices. The DCF return will still be k', and the allowed dollar return R' will still have a

[28] The average market-to-book ratio for Standard and Poor's 400 Industrials has been 1.66 in the post-war period 1946–1975. Since this figure is biased upward because of the understatement of book values, the actual long-run ratio of market value to book value for industrials is probably between 1.25 and 1.50.

[29] The emphasis on "long run" in this paragraph is to recognize that market-to-book ratios may, for short periods of time (as on the downside of a business cycle), fall below average, and even below one. What matters is the profitability and market-to-book ratio over time as the swings in the business cycle offset one another and establish the long-run pattern of profitability.

[30] Institutionalists such as Clark [1926] and Glaeser [1927] argued long ago that regulators should set the rate of return so that it brings market value into equilibrium with book value.

real value R. There is ample evidence to suggest that equilibrium yields have risen with increases in the rate of inflation.[31] There is, therefore, no need to adjust the rate base for price level changes when using a DCF rate of return.[32]

SUMMARY AND CONCLUSION

In this paper we have looked at the two cost-of-capital concepts most widely employed at the present time in regulation as conceptual bases for recommendations regarding the return on equity to be allowed the regulated firm. The *comparable earnings* approach is currently the most widely employed method, and looks to the earned returns on equity of comparable firms as a purported measure of the opportunity cost of capital invested in the regulated sector. This approach to the cost of equity is subject to infirmities that render it inappropriate as a cost-of-capital concept in regulation. On the one hand are problems of measurement, with accounting rates of return being biased generally upward, and with the lack of comparability of risk between regulated firms and unregulated firms. On the other hand is the conceptual problem following from the fact that earned rates of return on equity are a measure of the average return on investment rather than the marginal return on investment. Since ARI > MRI is the general case for competitive unregulated firms, and since public utilities are allowed a constant return on investment (ARI = MRI), the comparable earnings approach leads to an overestimate of the opportunity cost of capital and fails to promote allocative efficiency.

An alternative cost-of-capital concept in regulation is the *discounted cash flow* concept. This approach bases the allowed return or yield on the shares of public utility stocks. Given the relative mobility of capital flows it can be argued that this share yield is equal to the marginal return on investment earned by "other enterprises having corresponding risks." Since the DCF approach embodies a proper concept of return at the margin, it is preferable to comparable earnings as a regulatory tool for determining the cost of equity for public utilities.

The monetary losses and wealth transfers associated with the use of comparable earnings may be substantial. The author's experience in rate-of-return regulation suggests that the comparable earnings approach overestimates the cost of equity (in absolute differences) by about 2–4%. Given a present equity base of about $116.5 billion, this suggests an overcharge of $20 to $50 billion annually. The use of a conceptually superior method of determining rate of return should have pragmatic appeal to those interested in lower utility rates as well as academic appeal to those who might be interested solely in conceptual implications of alternative cost-of-capital concepts in regulation.

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[31] See Keran [1976] and Copeland [1977] for evidence that share yields have risen with increases in the rate of inflation.

[32] Gordon [1977] has shown that investors will be indifferent between the nominal cost of capital on a historical cost rate base and the real cost of capital on a price-level adjusted rate base.

References

Ayanian, Robert. 1975. "Advertising and Rate of Return." *Journal of Law and Economics* 18 (Oct.): 479–506.

Beaver, William H.; Kettler, Paul; and Scholes, Myron. 1970. "The Association Between Market and Accounting Determined Risk

Measures." *Accounting Review* 45(Oct.): 654–82.

——— and Manegold, James. 1975. "The Association Between Market-Determined Measures of Systematic Risk: Some Further Evidence." *Journal of Financial and Quantitative Analysis* 10 (June): 231–83.

Bloch, Harry. 1974. "Advertising and Profitability: A Reappraisal." *Journal of Political Economy* 82(March/April): 267–86.

Blume, Marshall. 1971. "On the Assessment of Risk." *Journal of Finance* 26(March): 1–10.

Breen, William J., and Lerner, Eugene M. 1972. "On the Use of β in Regulatory Proceedings." *Bell Journal of Economics and Management Science* 3(Autumn): 612–21.

Brozen, Yale. 1977. "Foreword." In *Intangible Capital and Rates of Return*, by Kenneth W. Clarkson. Washington, D.C.: American Enterprise Institute for Public Policy Research.

Clark, John M. 1926. *Social Control of Business*. Chicago, Ill.: The University of Chicago Press.

Clarkson, Kenneth W. 1977. *Intangible Capital and Rates of Return*. Washington, D.C.: American Enterprise Institute for Public Policy Research.

Copeland, Basil. 1977. "Estimates of the Cost of Equity for Public Utilities, 1961–1976." 21 pages, unpublished.

Glaeser, Martin G. 1927. *Outlines of Public Utility Economics*. New York: MacMillan Co.

Gordon, Myron J. 1974. *The Cost of Capital to a Public Utility*. East Lansing: Michigan State University.

———. 1977. "Comparison of Historical Cost and General Price Level Adjusted Cost Rate Base Regulation." *Journal of Finance* 32 (Dec.): 1501–12.

Ibbotson, Roger G., and Sinquefield, Rex A. 1976. "Stocks, Bonds, Bills, and Inflation: Year-by-Year Historical Returns (1926–1974)." *Journal of Business* 49(Jan.): 10–47.

Kahn, Alfred. 1970. *The Economics of Regulation: Principles and Institutions, Vol. I*. New York: John Wiley and Sons.

Keran, Michael W. 1976. "Inflation, Regulation, and Utility Stock Prices." *Bell Journal of Economics* 7(Spring): 268–80.

Keynes, John M. 1965. *The General Theory of Employment, Interest, and Money*. New York: Harbinger Edition.

Klemkosky, Robert C., and Martin, John D. 1975. "The Adjustment of Beta Forecasts." *Journal of Finance* 30(Sept.): 1123–28.

Langum, John K. 1975. "Testimony Regarding Fair Rate of Return Filed on Behalf of Arkansas Power and Light Company." *Arkansas Public Service Commission, Docket U-2649*.

Leventhal, Harold. 1965. "Vitality of the Comparable Earnings Standard for Regulation of Utilities in a Growth Economy." *Yale Law Journal* 74(May): 989–1018.

Levy, Robert A. 1971 "On the Short-Term Stationarity of Beta Coefficients." *Financial Analysts Journal* 27(Nov./Dec.): 55–62.

Lewis, Ben. 1966. "Emphasis and Misemphasis in Regulatory Policy." In *Utility Regulation: New Directions in Theory and Policy*, eds. William G. Shepherd and Thomas G. Gies. New York: Random House.

Lintner, John. 1965. "The Valuation of Risk Assets and the Selection of Risky Investments in Stock Portfolios and Capital Budgets." *Review of Economics and Statistics* 47 (Feb.): 13–37.

Melicher, Ronald W. 1974. "Financial Factors Which Influence Beta Variations Within a Homogeneous Industry Environment." *Journal of Financial and Quantitative Analysis* 9(March): 231–241.

———, and Rush, David F. 1974. "Systematic Risk, Financial Data, and Bond Rating Relationships in a Regulated Industry Environment." *Journal of Finance* 29(May): 537–44.

Meyers, Stuart C. 1972*a*. "The Application of Finance Theory to Public Utility Rate Cases." *Bell Journal of Economics and Management Science* 3(Spring): 58–97.

———. 1972*b*. "On the Use of β in Regulatory Proceedings: A Comment." *Bell Journal of Economics and Management Science* 3(Autumn): 622–27.

Morton, Walter. 1970*a*. "The Investor Capitalization Theory of the Cost of Equity Capital." *Land Economics* 46(Aug.): 248–63.

———. 1970*b*. "Guides to a Fair Rate of Return." *Public Utilities Fortnightly* (July 2): 17–30.

Mossin, Jan. 1966. "Equilibrium in a Capital Asset Market." *Econometrica* 34(Oct.): 768–83.

Popper, Karl. 1969. *Conjectures and Refutations. The Growth of Scientific Knowledge*. New York: Harper Torchbooks.

Roseman, Herman. 1970. "Comparable Earnings and the Fair Rate of Return." In *Annual Report Section of Public Utility Law*: American Bar Association.

Sharp, William F. 1964. "Capital Asset Prices: A

Theory of Market Equilibrium Under Conditions of Risk." *Journal of Finance* 19(Sept.): 425–42.

Solomon, Ezra. 1970. "Alternative Rate of Return Concepts and Their Implications for Utility Regulation." *Bell Journal of Economics and Management Science* 1(Spring): 65–81.

Stauffer, Thomas R. 1971. "The Measurement of Corporate Rates of Return." *Bell Journal of Economics and Management Science* 2(Autumn): 434–69.

Trebing, Harry. 1974. "Realism and Relevance in Public Utility Regulation." *Journal of Economic Issues* 8(June): 209–33.

Weston, J. Fred, and Brigham, Eugene F. 1969 *Managerial Finance*, 3rd Edition. New York: Holt, Rinehart, and Winston.

———. 1975. *Managerial Finance*, 5th edition. Hinsdale, Ill.: The Dryden Press.

Williams, John B. 1938. *The Theory of Investment Value*. Cambridge: Harvard University Press.

Regulation and Modern Finance Theory
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REGULATION AND MODERN FINANCE THEORY*

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I. INTRODUCTION

IN RECENT YEARS, we have experienced numerous disputes over the rate a public utility should be allowed to earn. More often than not the difference between what a company requests and what the staff of a public utility commission recommends is substantial. Prolonged hearings are held with great costs to both parties. Even when the Commission reaches a decision, it sometimes is appealed to the courts with additional costs and delays. The problem is that the law relating to regulation is subject to ambiguous interpretations in a number of key areas.

The purpose of my address is to explore this ambiguity in some detail and to examine an alternative approach to establishing a proper rate of return on equity capital. While this examination is rooted in modern finance theory, the focus of my address is on developing a better understanding of the problem and on policy implications as opposed to extending the theory. We begin by reviewing the legal principles underlying regulation followed by an examination of the rate-making process as it is practiced. The meaning of a "just and reasonable" rate of return to the equity holder is next explored. An alternative approach to regulation and its implications will be discussed in Sections V and VI. Concluding comments appear in the last section.

II. THE LEGAL PRINCIPLES UNDERLYING REGULATION

The regulation of public utility companies is not a task assigned to a single governmental agency. Quite the contrary is true. At the national level, a number of federal agencies (such as the Federal Communications Commission, the Federal Power Commission, and others) are involved in regulating the companies engaged in interstate commerce. At the state level, each state has a "public utilities commission." In addition, many smaller jurisdictions (such as cities) regulate local utilities such as garbage collection, etc.

*Presidential address written for the American Finance Association, December 29, 1977.

**After an extended illness, Alexander A. Robichek died of cancer on February 2, 1978. At the time of his death, he was the A. P. Giannini Professor of Banking and Finance, Graduate School of Business, Stanford University.

The legal principles underlying the regulation of public utility companies rest primarily on two Supreme Court cases: *Bluefield Water Works & Investment Co. v. Public Service Commission of the State of West Virginia (262 U.S. 679, 1923)*, and *Federal Power Commission v. Hope Natural Gas Company (320 U.S. 591, 1944)*. The two cases will henceforth be referred to simply as "*Bluefield*" and "*Hope*." The case law specifies that the rate-making process "involves a balancing of the investor and consumer interests." (*Hope*, 603).

The Congress in the Natural Gas Act of 1938 defines the rate-making process as the fixing of "just and reasonable rates." (*Hope*, 603). The legal standard against which "just" and reasonable" is measured was stated in the *Bluefield* case: "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.... 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 money necessary for the proper discharge of its public duties." (*Bluefield*, 693).

In the *Hope* case, the Court explicitly recognized that revenues must also cover "capital costs." The Court stated: "From the investor or company point of view it is important that there be enough revenue not only for operating expenses but also for the capital costs of the business. These include service on the debt and dividends on the stock.... By that standard the return to the equity owner should be commensurate with returns on investments in other enterprises having corresponding risks." (*Hope*, 603).

Some of the most difficult issues in regulatory cases have concerned the manner in which a regulatory body is to determine what constitutes "just and reasonable" rates. The Supreme Court has held that the regulatory commissions need not be "bound to the use of any single formula or combination of formulae in determining rates." (*Hope*, 602). The Court stated further that "under the statutory standard of 'just and reasonable' it is the result reached not the method employed which is controlling...." It is not theory but the impact of the rate order which counts. If the total effect of the rate order cannot be said to be unjust and unreasonable, judicial inquiry... is at an end. The fact that the method employed to reach that result may contain infirmities is not then important." (*Hope*, 603).

Several Justices who took part in the *Hope* decision disagreed with the majority opinion on some of these issues. For example, Justice Reed, dissenting, states: "When the phrase (just and reasonable) was used by Congress to describe allowable rates, it had relation to something ascertainable.... The rates fixed would produce an annual return and that annual return was to be compared with a theoretical just and reasonable return..." (*Hope*, 621). He continues, "My disagreement with the Court arises primarily from its view that it makes no difference how the Commission reached the rate fixed so long as the result is fair and reasonable." (*Hope*, 623).

Justice Jackson, dissenting on the same point, states: "We need not be slaves to a formula but unless we can point out a rational way of reaching our conclusions they can only be accepted as resting on intuition or predilection.... The Court sustains this order as reasonable, but what makes it so or what could possibly make it otherwise, I cannot learn." (*Hope*, 645–646).

Justice Frankfurter, also dissenting, makes a telling point when he states: "The requirement that rates must be 'just and reasonable' means just and reasonable in relation to appropriate standards. ...To what sources then are the Commission and the courts to go for ascertaining the standards relevant to the regulation of...rates? ...There appear to be two alternatives. Either the fixing of...rates must be left to the unguided discretion of the Commission so long as the rates it fixes do not reveal a glaringly bad prophecy of the ability of a regulated utility to continue its service in the furture. Or, the Commission's rate orders must be founded on due consideration of all the elements of the public interest..." (*Hope*, 626). Frankfurter continues, "In order for this Court to discharge its duty of reviewing the Commission's order, the Commission should set forth with explicitness the criteria by which it is guided in determining that rates are 'just and reasonable'..." (*Hope*, 627–628).

In order to better understand some of the reasons for the difficulties encountered by regulatory Commissions and the courts in resolving rate controversies, the next section will provide a review of various practical aspects of the rate-making process.

III. Review of the Rate Making Process

A. *The Approach in General*

The process of determining the "just and reasonable" rates is difficult to discuss in the abstract. For this reason, Figure 1 and Table 1 were prepared to illustrate the principal areas of controversy. Figure 1 presents a simplified summary of the process used to reach the "allowed return to capital." The "allowed return to total capital" of $81,000,000 shown as the final step in Figure 1, is reached by first determining a "just and reasonable" rate of return (9.0% in the example and then multiplying this rate by the approved "capital base" ($900,000,000). To reach the "rate of return," the commissions usually follow the steps illustrated in the upper part of Figure 1. That is, the commissions determine the "just and reasonable" rates to debt and to the equity (7.0% and 12.0% respectively).[1] These rates are then multiplied by the appropriate proportions of debt and equity in the firm. Thus, the 9.0 per cent "rate of return to total capital" is a weighted average of the return to the debt holders and to the equity holders.

Table 1 presents a sample of calculation of the amount of "total revenue" to be generated from the allowed rates, using as the basis the values of Figure 1. One item to be noticed is that the allowed rates must provide not only the "return to the capital" but also be sufficient to cover the operating expenses of the business

1. Preferred stock and interest charged construction are ignored for purposes of this illustration.

TABLE 1

SAMPLE CALCULATIONS TO DETERMINE TOTAL COSTS TO SERVICE CAPITAL AND TOTAL REQUIRED REVENUE

		%
Assume: Debt =	$540,000,000	60%
Equity =	360,000,000	40%
Total Capital	$900,000,000	100%
"Just and Reasonable" Return to Equity (12% × 360,000,000)	$43,200,000	
+ Income Taxes (50% of Profit Before Taxes)	43,200,000	
Required Profit Before Taxes	$86,400,000	
+ Interest (7% × 540,000,000)	37,800,000	
Required Profit Before Interest and Taxes	$124,200,000	
+ Operating Expenses (Assumed)	350,000,000	
= Total Required Revenue	$474,200,000	

Memo:
Cost Rate to Service Capital and Taxes = (Required Profit Before Interest and Taxes) ÷ Capital Base

or

Cost "Rate" = 124,200,000/900,000,000 = 13.8%.

(assumed at $350,000,000 in the example) and income taxes (assumed at 50% of profits before taxes). Since income taxes are based on the profit before taxes but *after* interest expense, the amount of total revenue required to service capital cannot be determined merely from a knowledge of the allowed rate on total capital. The required amount of revenue will also depend on the proportions of debt and equity in the firm. In other words, knowledge of the 9.0% allowed rate of return on total capital (Figure 1) is not sufficient information to determine the total cost to the consumers of servicing capital.

Given our current tax laws, to provide a $1 return to the debt holders (*i.e.*, interest), the commission need provide only $1 of revenue. But, it takes approximately $2 of revenue to provide a $1 return to the equity holders because the firm must pay income taxes. In Table 1, in order to provide a return of $43,200,000 to the equity holders, the commission must allow a profit before taxes of $86,400,000. From the point of view of the consumer, the total cost to service capital *and* taxes is the "profit before interest and taxes" or $124,200,000 in Table 1. The last item on Table 1 shows this total to be 13.8 per cent of the total capital.

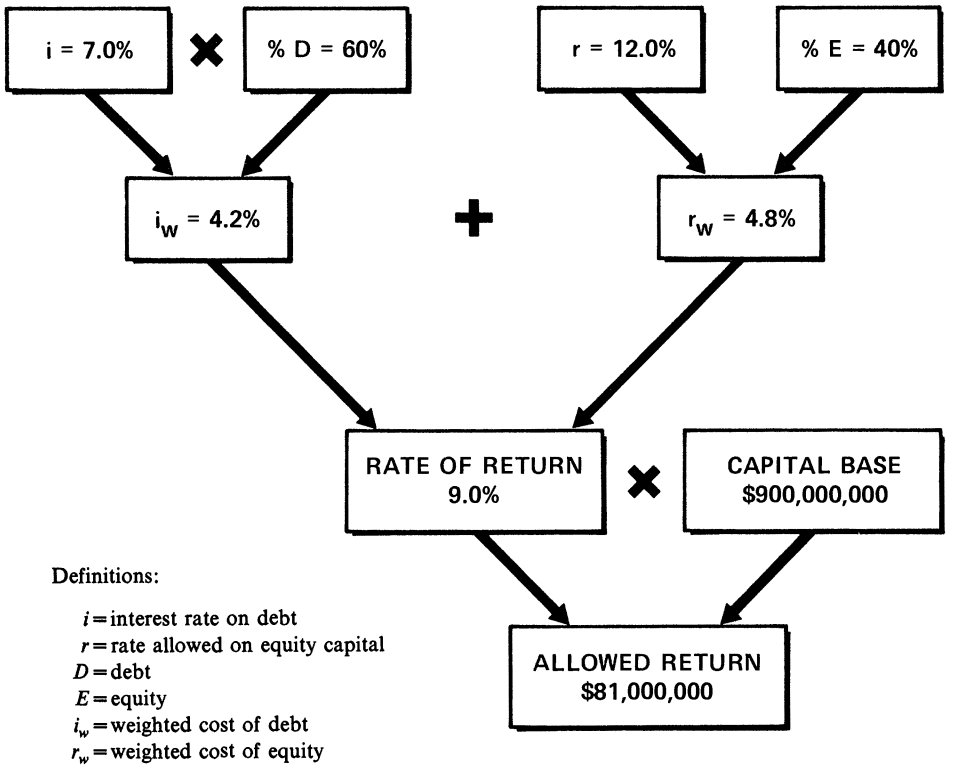

FIGURE 1. A Summary View of the Regulatory Process

B. *Areas of Regulatory Controversy*

Almost all items shown in Figure 1 and Table 1 are subjects of controversy in regulatory proceedings. A brief summary of the principal questions at issue is given below.

1. As a rule the rate of return on debt is the least controversial item. Still, the problems arise in resolving the questions of what the rate should be in a period where future interest rates can be expected to exceed the interest costs of the existing debt. In the last dozen years, there has been a steep rise in interest rates and this issue has become more significant in recent regulatory hearings.
2. The "just and reasonable" rate of return to the equity holders is a matter of major controversy. It is not at all unusual for various expert witnesses in a case to recommend widely differing rates in this regard.
3. The appropriate proportions of debt and equity are on occasion a matter at issue. An important reason is traceable to the fact that equity "costs" the consumer roughly twice as much as debt, because of the tax effect. If the commission accepts the company's capital proportions as reasonable, the problem does not arise. But, in some instances, the commissions do not accept such proportions and impute debt/equity proportions other than those actu-

ally used by the firm. As a rule, the imputed proportions assume a larger proportion of debt than the actual proportions.

4. The appropriate level of the "capital base" usually is a controversial subject. A number of questions arise in this regard, the most common of which are concerned with: (a) what should be included in or excluded from the base; (b) which "test" period should be considered; and (c) should the base be measured in terms of historical cost or "fair" value.
5. The level of "operating expenses" generally is subjected to some regulatory scrutiny. Certain expenses (*e.g.*, advertising) are sometimes excluded from allowed expenses. Other expenses may be reviewed for reasonableness.
6. Finally, the commissions, having determined an allowed level of total revenue, must also regulate the manner in which such revenue is to be raised. Specifically, the commission approves a schedule of rates for each type of service offered by the utility. By estimating the rate of service use, the commissions can estimate the total revenue to be generated from all services.

The range of problems mentioned above should convince even the most severe critic of the regulatory procedures that the commissions are faced with a complex task. To an important extent, the difficulties facing regulators arise because the law itself is subject to alternative interpretations in a number of important areas affecting rate-making. The next section will describe some important aspects of rate-making where ambiguities in interpreting the law exist.

C. *Problems in Interpreting the Law*

As we know, the law on rate-making is a subject of considerable controversy even among the justices of the Supreme Court. The areas of controversy are numerous, as evidenced by the large number of dissenting opinions on a wide variety of issues. Four key areas of judicial controversy will be examined below: (1) the Rate of Return and the Rate Base; (2) Investment Risk; (3) Comparison of Rates and Return; and (4) Return to the Equity Owner.

1. *The Rate of Return and the Rate Base.* As shown in Figure 1, the process of rate-making generally involves the determination of a "just and reasonable" rate of return *and* a "capital base" against which this rate is to be applied. The legal basis for this general approach can be traced to one of the earliest Supreme Court decisions in the regulatory area. In Smyth v. Ames (169 U.S. 467) the court stated: "What the company is entitled to ask is a fair return upon the value of that which it employs for the public convenience.... And, in order to ascertain that value,..., the amount and market value of its bonds and stock,...are to be given such weight as may be just and right in each case."

Some of the problems of determining the proper "base" have been discussed in one of the earlier sections. But, the problem is far more complicated than the question of what to include or exclude from the "rate base." The Supreme Court recognized this problem in the *Hope* case: "It does, however, indicate that 'fair value' is the end product of the process of rate making not the starting point.... The heart of the matter is that rates cannot be made to depend upon 'fair value' when the value of the going enterprise depends on earnings under whatever rates

may be anticipated." (*Hope*, 601). Having recognized the existence of circularity, however, the court does not suggest how this issue is to be resolved.

2. *Investment Risk.* A similar problem to the one just described is present in the case of "investment risk." As noted in an earlier section, the law states that allowed rates of return should be commensurate with those earned by enterprises "attended by corresponding risks and uncertainties." (*Bluefield*, 692).

The problem arises because, for a regulated company, the business (and, hence, investment) risk *depends* on the regulatory decision. To require that the rates be set after giving due consideration to "risk" is circular when such "risk" is determined to a large extent by the rate-making process.

3. *Comparison of Rates of Return.* The law requires that regulators allow rates "equal to that generally being made at the same time...on investments in other business undertakings..." (*Bluefield*, 692).

Clearly, the law implies a concurrent standard. But, regulatory hearings typically stretch over several months. Testimony upon which the rate decision is based may often be several months old by the time the decision is rendered by the commission. Moreover, any comparisons to other business enterprises are based on the past, while the rates, once set, apply to the future.

4. *Return to the Equity Owner.* The law is explicit in identifying "the equity owner" as the investor group which should receive a return "commensurate with returns in investments in other enterprises having corresponding risks." (*Hope*, 603). Yet, the application of this standard has a number of problems. How is "return to the equity owner" to be measured? Should it be on the basis of "book" value or "market" value? Over what time period should the comparison be made?

Before attempting to suggest answers to some of these questions, one needs to understand the meaning of a "just and reasonable" return to the equity holder. To this problem we now turn.

IV. The "Just and Reasonable" Rate of Return to the Equity Holder

A. *The General Problem*

The equity holder, of course, is the residual owner of the firm. This factor is nowhere more clearly evident than in regulated public utilities. *Ceteris paribus*, an increase or decrease in allowed revenues "flows", except for income taxes, directly through to the equity owner. In contrast, the debt rate is determined by market forces. In the absence of defaults, the debt holder receives neither more nor less than the "just and reasonable" rate. Any difference (positive or negative) between the allowed rate on debt and the actual rate on debt will be absorbed approximately equally by the government (in the form of higher or lower income taxes) and the equity holders.

It follows that the test of whether allowed rates of return to the capital providers are "just and reasonable" must be applied to the company's equity holders. It is precisely on this issue that the commissions and the courts have experienced the

greater difficulties. The main problem has been one of defining the standard against which to measure the "just and reasonable" criterion.

Before considering the question of an appropriate standard, it is essential to understand the two main approaches used in regulatory proceedings to arrive at "just and reasonable" rates of return to the equity holders: "comparable earnings" and "discounted cash flow."

B. "*Comparable Earnings*" *vs.* "*Discounted Cash Flow*"

Of the two approaches mentioned above, the "comparable earnings" approach has been around as long as the regulatory process itself. The essential elements of this approach are as follows:

1. Analyze rates of return earned on the *book value* of the equity capital of various industry groups—both regulated and unregulated.
2. Establish comparability of "investment risk."
3. Determine the "just and reasonable" rate based on (1) and (2) above.

Several significant problems are encountered in applying the "comparable earnings" approach.

First, comparison of rates of earnings with other regulated companies leads to circularity. If all regulatory commissions looked merely at each other, no deviations of any magnitude would ever occur even if economic conditions were to warrant a change.

Second, comparisons of rates of earnings on book value between regulated and non-regulated companies are easily challenged on at least two gounds: (1) Lack of comparability of investment risk; and (2) Differences in accounting practices between regulated and non-regulated companies often make rate of return comparisons meaningless.

To avoid some of the problems noted above, the "discounted cash flow" (or DCF) approach has been proposed as an alternative to the "comparable earnings" approach. This approach is relatively new—its use in regulation is limited to the past dozen years. The "discounted cash flow" name derives from the basic financial principle that investors value securities by "discounting" to the present the expected future "cash flows" attributable to the securities. The "cash flows" include dividends and the expected eventual liquidation market value of the shares; the "discount" rate is a market determined rate that takes into account current market conditions *and* the investment risk of the particular security. The rationale for the DCF approach rests on the argument that by estimating the current investors' required rate of return, one takes into account the investment risk of the security. If the estimate is correct, no longer is it necessary to make extensive comparisons to establish "comparability of investment risk."

While the method has considerable intuitive appeal, its actual application in regulation is far from simple. The principal difficulties surround the process by which one estimates the investor's required (DCF) rate of return and how one applies the estimated rate of return to determine the "just and reasonable" rate of return on the *book value* of the company's equity.

If a company's allowed rate of return on book value is set exactly equal to the investors' required rate of return then the company's market value per share will approximate its book value. But, regulation which is intended to force the market price to equal book value is inconsistent with the concept that equity securities of regulated companies should be treated as equity securities. Maintaining market value around book value is tantamount to converting an equity security to a perpetual, subordinated bond. Such regulation could be unfair both to equity holders *and* to consumers. For example, the regulation of rates in such a way as to force the market value of shares to equal book value could be unfair to the equity holders when equity securities of non-regulated companies are rising in market value. On the other hand, not permitting the market price to decline at a time when the market values of equities of non-regulated companies are declining could cause utility rates to consumers to be higher than otherwise would be the case.

V. An Alternative Approach to the Regulation of "Just and Reasonable" Rates

Rather than comparable earnings or DCF, we suggest in this section an alternative approach to the regulatory process of determining "just and reasonable" rates. It is based on the following five principles: 1. The role of regulation is to act as a substitute for competition. While this principle may be considered self-evident, it needs to be specifically stated. So long as it is the national policy to be a capitalistic society and to permit privately owned utility companies, the return to capital suppliers should be consistent on a risk-adjusted return basis with all the returns available from non-regulated companies. In particular, regulation should not eliminate equity characteristics from the equity securities issued by regulated companies. It is the role as well as expectation of common stockholders to bear the "residual investment risk" of a company and to be rewarded or penalized accordingly.

2. The desired *end product* of regulation is to set rates so as to "balance the interests of consumers and investors." From the point of view of the consumers, "just and reasonable" rates imply minimum operating expenses and minimum costs to service capital consistent with a given quality of service. From the point of view of providers of capital, "just and reasonable" rates imply rates of return comparable to rates of return on alternative investments of similar risk in the non-regulated sector. The task faced by regulators, then, is to set rates that are "just and reasonable" from the viewpoint of both the consumer *and* the investor.

3. Investments in equity shares are made by the purchase of shares at market prices. Therefore, the fairness of the rate of return to the investor must be judged from the investor's point of view in the market place and not on the basis of book value. Table 2 was prepared to illustrate the large differences which are possible in market versus book rates of return. The table shows annual rates of return on the two bases for an actual electric utility company from 1962 to 1976 inclusive. We see that the annual rates of return based on book value have fluctuated very little, while the annual rates of return to the investor in the market have fluctuated quite

TABLE 2

ANNUAL RATES OF RETURN TO THE INVESTORS OF SIERRA PACIFIC POWER COMPANY SHARES COMPARED TO RATES OF RETURN ON AVERAGE BOOK EQUITY
(1962–1972 Inclusive)

Year	Annual Rate of Return to the Investor*	Rate of Return on Average Book Equity
1962	− .4%	11.3%
1963	34.7	13.1
1964	22.3	12.3
1965	−2.8	12.1
1966	−12.8	11.9
1967	−3.8	12.2
1968	37.0	12.7
1969	−22.4	11.6
1970	15.4	11.3
1971	−1.7	11.9
1972	−11.5	11.0
1973	−25.9	11.5
1974	−12.0	11.8
1975	0.6	8.8
1976	106.3	11.8

*Annual Rate of Return=(Change in Price + Dividend)/Closing Price at End of Preceding Year

wildly. This illustration shows that a stable rate of return on book value *does not* necessarily lead to stable rates of return to the investor in the market place.

It is clear that regulators should be concerned with the rates of return in a *market value* context. Since the market value of a regulated firm's shares depends to an important extent on the rates allowed, regulatory commissions must be concerned with the expected impact of their decisions on the market price of the firm's shares. The allowed rate of return on the book value of the equity holders' interest may be considered as *the means* by which the commission attains its desired end, but should not be an end in itself.

4. The degree of investment risk is not independent of the rate-making process itself. Moreover, since "investment risk" may be defined in a variety of ways, it is necessary to state explicitly what is meant by the term. This topic will be explored in more detail below.

5. The fairness of the rate of return to the equity holders can only be judged retrospectively. The determination of whether the allowed rates will lead to a rate of return to the investors that is too high, too low, or "just and reasonable" cannot be made *ex ante*. The judgment can only be made *ex post*.

Given these five principles, the essential feature of the proposed approach is to compare the rate of return to the equity holder of a regulated utility company with a clearly identifiable standard from the non-regulated financial sector. The standard proposed draws on the well known capital asset pricing model and requires

the specification of two financial variables: (1) The return on a riskless security; and (2) the return on a broadly diversified portfolio of equity securities of non-regulated companies. The investment risk factor for a given company is defined in terms of a specified beta. With these inputs we know that we are able to compute the required rate of return on equity for the company in question. As the approach is well known, it is unnecessary to illustrate its application. The idea, of course, is to determine a "just and reasonable" rate of return to the equity holder. That the approach has appeal is evident in the recent State of Oregon hearings where the Public Utility Commission has ruled that the capital asset pricing model be the primary means by which required rates of return on equity are determined.

VI. Implications for the Regulatory Process

The capital asset pricing model approach has a number of implications for regulation, and this is the area where attention needs to be focused. It is important to recognize that the approach can only be extended to the aggregate rate-making problem if several conditions are met:

1. The company's operating expenses are judged to be reasonable;
2. The company's expansion policy is appropriate to the needs of the consumers;
3. The company's financial structure (*i.e.*, the proportions of debt, preferred stock, and equity) is appropriate;
4. The company's specific financing choices (*e.g.*, timing of debt or equity issues) are justified; and
5. The regulation of the company's rates of return was judged "just and reasonable" as of a previous point in time. This point in time would then serve as the starting point from which to judge the fairness of realized rates.

If these conditions are met, the regulatory approach proposed in the paper would provide the basis for resolving some of the current conflicts in rate-making. Needless to say, however, these conditions pose considerable problems. The application of the capital-asset pricing model approach in this context requires a dramatic change in the manner in which regulation is handled.

In its idealized form, the approach would operate along the following lines:

1. The company and the regulators would agree on the specific parameters along which to measure the "just and reasonable" rate of return to the equity holders. These parameters would be along the lines discussed in the preceding section.
2. The regulators would need to approve the major items of operating expenses, such as salaries, labor contracts, etc., and major capital commitments.
3. An agreement would need to be reached on the appropriate capital structure for the company.
4. Major financing decisions would be subject to regulatory approval.
5. A starting point in time and a "fair market value of the shares" at that time would be subject to agreement.

Once agreement is reached on the above points, such agreement would be considered binding. For example, if the regulators approved the company's expan-

sion policy and the manner in which the expansion were to be financed, the investors would then become entitled to receive a "just and reasonable" expected return on the funds committed for expansion purposes. But, as noted above, the proposed approach would work well *if and only if* the company and the regulators were to agree on all the various points mentioned above.

If implemented properly, however, the proposed approach would serve to partially resolve or even to eliminate a number of complex and controversial issues in rate-making. The list below illustrates some of the principal benefits.

1. The approach provides a standard against which to measure the fairness of the rates of return to the equity holders. The standard takes into account investment risk and avoids the problem of circularity by using the non-regulated sector as the basis for comparison.
2. The question of whether "flow-through" or "normalization" should be used for purposes of rate-making would no longer be relevant. Similarly, other accounting questions (such as over-capitalization, interest charged construction, etc.) would no longer be a matter of great concern.
3. It no longer would be necessary to worry as much about what to include in the "capital base" and what "rate" to allow on that base. The overall rates allowed would have to provide for: (a) all proper operating expenses; (b) interest on debt; (c) income taxes; and (d) "just and reasonable" rates of return to the equity holders in the market place.
4. Finally, the proposed approach should be simpler to administer than the current method of rate-making. Given the high cost of regulatory hearings, the savings could be significant.

While the capital-asset pricing model approach should eliminate some of the complex issues facing regulators, the approach brings with it some new problems.

1. The approach itself would need to be studied, understood, and probably revised so as to meet the practical needs of regulators.
2. What external standards should be selected for investment comparison purposes?
3. How often should rates be adjusted?
4. Is there a possible "chicken or egg" problem? That is, if the market *expects* the commission to act so as to bring the rate of return of a regulated company's shares to a particular target level, will the price adjustment affect the rate of return calculations?
5. How does the market react to regulatory action? In particular, how does the rate of return on a book value basis influence the market value of the company's shares?
6. How should the regulators deal with the "plant under construction?" That is, how does the commission provide a "just and reasonable" return on plant that is not yet in use?

The preceding sections discussed the extent to which the proposed approach to rate-making would eliminate some of the current problems facing regulators and

cause new ones. There exist, however, a set of problems that will continue to be with us whichever approach is used. Among these are:

1. How to compensate efficiency and penalize inefficiency. A well-managed, efficient company should be entitled to share to some extent the benefits resulting from an efficiently run operation. Similarly, an inefficient company should be forced to bear the costs of inefficiency. The mechanics of developing a system that would resolve this point in an equitable manner faces regulators today and will continue to face them under the proposed approach.
2. What is the economically justified manner of setting the rates to the various subscribers? Should rates be set so as to subsidize certain user groups?
3. How to resolve issues where the commission's staff and the company disagree on key points.

In addition to the problems listed above, other issues may exist or arise as time passes. These were not intentionally omitted. Rather the intent was to list those issues with which I am most familiar.

VII. Concluding Comments

Much of the time in regulatory hearings is spent in presenting testimony or examining witnesses in areas where no useful standard exists against which to judge the reasonableness of the testimony. The approach examined in this address, while introducing some new issues into the regulatory process, suggests ways of resolving some of the most complex current issues. In particular, the approach provides a standard against which to measure the fairness of the rates of return to the firm's equity holders which does not contain elements of circular reasoning.

It is important that the capital-asset pricing model approach be evaluated in relation to the legal environment in which utilities and regulators operate, and that was the purpose of the early part of this address. It seems to me that the approach has much to offer in establishing a "just and reasonable" return standard, around which much of the hearings and legal complications revolve. To the extent such standardization would reduce the cost of and lags in rate hearings, there would be a real gain to society. The approach should not be viewed as the "finished product," but rather as a prototype which needs improvements, but which is beginning to prove its usefulness.

CERTIFICATE OF SERVICE

The undersigned hereby certifies that one copy of the foregoing pleading has this day been served by a means permitted under Rule 2010 of the Commission's Rules of Practice and Procedure (18 C.F.R. § 385.2010) on each person whose name appears on the Official Service List compiled by the Secretary in this proceeding.

/s/ *Kenneth M. Holmboe*
Kenneth M. Holmboe
Duncan & Allen

Dated at Washington, D.C.
This 26th day of June, 2019.