Jonathan A. Lesser, Ph.D.

Partner

Summary of experience

Dr. Jonathan Lesser is a Partner with Bates White, LLC, with more than 20 years experience working for electric utilities, government, and as an economic consultant. He has addressed critical economic and regulatory issues affecting the energy industry, including gas and electric utility structure and operations, mergers and acquisitions, cost allocation and rate design, resource investment decision strategies, cost of capital, depreciation, risk management, incentive regulation, economic impact studies, and general regulatory policy.

Dr. Lesser has designed complex models to value nuclear, fossil-fuel, and renewable generating assets, as well as long-term power contracts in the presence of market, regulatory, and environmental uncertainty. He has also actively participated in negotiations for qualifying facilities under PURPA, relicensing of hydroelectric plants, and electric industry market design. Dr. Lesser has testified before public utility commissions in Alaska, Arkansas, Connecticut, Illinois, Maryland, New Jersey, Oklahoma, Rhode Island, and Vermont; before the Federal Energy Regulatory Commission (FERC); before regulators in Mexico; testified in commercial litigation cases in Arizona, Vermont, and Washington; and testified before legislative committees in Connecticut, Maryland, Texas, Vermont, and Washington. He is the co-author of *Fundamentals of Energy Regulation*, which will be published in 2007 by Public Utilities Reports, Inc., and a contributing columnist for *Natural Gas & Electricity*.

Areas of expertise

- Cost of capital, return on equity, and capital structure
- Cost of service, depreciation, cost allocation, and rate design
- Regulatory policy and market design
- Risk management
- Generating asset valuation
- Environmental strategy analysis
- Market power analysis
- Economic impact analysis
- Commercial damages estimation

Selected industry, government, and business consulting experience

- For a major electric utility in Latin America, developed risk management strategies for hedging natural gas supplies with minimal up-front investment; prepared training materials for utility staff; and wrote the utility's risk management Policies and Procedures Manual.
- For a large owner and operator of nuclear generating plants, performed a confidential assessment of the likelihood of relicensing a specific nuclear plant in New England, given regulatory concerns over on-site spent fuel storage.
- For a major New York brokerage firm, performed a fairness opinion valuation of an electric generating facility.
- For a large municipal electric utility in Florida, analyzed the real option values of alternative proposed purchased generation contracts whose strike prices were tied to future natural gas and oil prices, and developed contract recommendations.
- For another municipal electric utility in Florida, developed an analytical model to determine risk-return tradeoffs of alternative generation portfolios and recommended asset purchase and sale strategies.
- For a large investor-owned utility in the Southeast, analyzed alternative environmental compliance strategies that directly incorporated uncertainty over future emissions costs, environmental regulations, and alternative pollution control technology effectiveness.
- For several electric utilities, developed economic models to evaluate offers by bidders in divestitures of nuclear power plants.
- For a Special Legislative Committee of the Province of New Brunswick, served as an expert advisor on the development of a deregulated electric power market.
- For Central Vermont Public Service Corp. and Green Mountain Power Corp., developed analyses of distribution capacity investments accounting for uncertainty over future peak load growth.
- For the Bonneville Power Administration, developed models to assess the economic impacts of generation resource development in Washington State and Oregon.
- For an electric utility in the Pacific Northwest, assisted in negotiations surrounding relicensing of a large hydroelectric generating facility.

- Served as an expert advisor for the Northwest Power Planning Council regarding future power supplies and economic growth.

Litigation experience

Regulated industries

- Submitted expert testimony on behalf of Baltimore Gas and Electric Co. in a proceeding before the Maryland Public Service Commission (Case No. 9063) regarding the optimal structure of Maryland's electric industry. Testimony focused on the benefits of competitive wholesale electric markets, and presented independent estimates of benefits since 1999.
- Submitted an expert report on behalf of Pemex-Gas y Petroquímica Básica in a rate proceeding and presented analysis before the Comisión Reguladora de Energía on the appropriate return on equity.
- Submitted expert testimony on behalf of the Vermont Dept. of Public Service in two concurrent proceedings before the Vermont Public Service Board (*Re: Green Mountain Power Corp.*, Dockets No. 7175 and 7176). Testimony focused on the cost of capital and allowed return on equity under cost of service regulation, as well as under a proposed alternative regulation proposal.
- Submitted expert testimony on behalf of BP Canada Marketing Corp. in a FERC proceeding regarding the rate application by Northern Border Pipeline Company (*Re: Northern Border Pipeline*, Docket No. RP06-072-000)). Testimony focused on natural gas supplies, economic lifetime, and depreciation rates.
- Performed analysis on behalf of the Transmission Agency of Northern California in a FERC proceeding (*Re: Pacific Gas & Electric Company*, Docket No. ER05-1284-000) regarding the appropriate return on equity, capital structure, and overall cost of capital. Case settled prior to filing expert testimony.
- Submitted expert testimony on behalf of the State of New Jersey Board of Public Utilities regarding the proposed merger between Exelon Corporation and PSEG Corporation. (*I/M/O The Joint Petition Of Public Service Electric And Gas Company And Exelon Corporation For Approval Of A Change In Control Of Public Service Electric And Gas Company And Related Authorizations, BPU Docket No. EM05020106, OAL Docket No. PUC-1874-050*). Testimony described the structure and results of a cost-benefit analysis to determine whether the proposed merger met the state's positive benefits test, and

included analysis of market power, value of changes in nuclear plant operations, and merger synergies.

- Performed analysis on behalf of Sierra Pacific Power Corp. in a FERC proceeding regarding the rate application by Paiute Pipeline Company (*Re Paiute Pipeline Company* Docket No. RP05-163-000). Analysis focused on depreciation analysis, negative salvage, and natural gas supplies. Case settled prior to filing expert testimony.
- Submitted expert testimony on behalf of Matanuska Electric in a Regulatory Commission of Alaska proceeding (*In the Matter of the Revision to Current Depreciation Rates Filed by Chugach Electric Association, Inc.*, Docket No. U-04-102). Analyzed the reasonableness of Chugach electric's depreciation study.
- Submitted expert testimony on behalf of Arkansas Oklahoma Gas Corp. in a Arkansas Public Service Commission proceeding (*In the Matter of the Application of Arkansas Oklahoma Gas Corporation for a General Change in Rates and Tariffs*, Docket No. 05-006-U). Analyzed and developed recommendation for the appropriate return on equity, capital structure, and overall cost of capital.
- Submitted expert testimony on behalf of Duke Energy North America, LLC in a FERC proceeding (*Re: Devon Power, LLC*, et al., Docket No. ER03-563-030). Testimony focused on appropriate market design for locational installed generating capacity in the New England market to ensure system reliability.
- Submitted expert testimony on behalf of Keyspan-Ravenswood, LLC in a Federal Energy Regulatory Commission, *KeySpan-Ravenswood, LLC v. New York Independent System Operator, Inc.*, Docket No. EL05-17-000. Estimated the damages arising from a failure by the NYISO to accurately calculate locational installed capacity requirements in New York City during the summer of 2002.
- Submitted expert testimony on behalf of the Electric Power Supply Association in a FERC proceeding (*Re: PJM Interconnection, LLC*, Docket No. EL03-236-002). Analyzed and critiqued proposed pivotal supplier tests for market power in PJM identified load pockets.
- Submitted expert testimony on behalf of the Vermont Dept. of Public Service in a Vermont Public Service Board proceeding (*Re: Shoreham Telephone Company*, Docket No. 6914). Analyzed and developed recommendation for the appropriate return on equity, capital structure, and overall cost of capital.
- Submitted expert testimony on behalf of the Vermont Dept. of Public Service in a Vermont Public Service Board proceeding (*Re: Vermont Electric Power Company*, Docket

No. 6860). Developed a least-cost transmission system investment strategy to analyze the prudence of a major high-voltage transmission system upgrade proposed by the Vermont Electric Power Company.

- Submitted expert testimony on behalf of pipeline shippers in a FERC proceeding (*Re: Northern Natural Gas Company*, Docket No. RP03-398-000). Performed gas supply analysis to determine pipeline depreciation rates as part of an overall rate proceeding.
- Submitted expert testimony on behalf of the Vermont Dept. of Public Service in a Vermont Public Service Board proceeding (*Re: Central Vermont Public Service Company*, Docket No. 6867). Analyzed and developed recommendation for the appropriate return on equity, capital structure, and overall cost of capital.
- Submitted expert testimony on behalf of the Vermont Dept. of Public Service in a Vermont Public Service Board proceeding (*Re: Green Mountain Power Corporation*, Docket No. 6866). Analyzed and developed recommendation for the appropriate return on equity, capital structure, and overall cost of capital.
- Submitted expert testimony on behalf of the Transmission Agency of Northern California in a FERC proceeding (*Re: Pacific Gas & Electric Company*, Docket Nos. ER03-409-000, ER03-666-000). Analyzed and developed recommendation for the appropriate return on equity, capital structure, and overall cost of capital.
- Submitted expert testimony on behalf of Arkansas Oklahoma Gas Corp. in a Oklahoma Corporation Commission proceeding (*Re: Arkansas Oklahoma Gas Corporation*, Docket No. 03-088). Analyzed and developed recommendation for the appropriate return on equity, capital structure, and overall cost of capital.
- Submitted expert testimony on behalf of Entergy Nuclear Vermont Yankee, LLC, in a Vermont Public Service Board proceeding (*Re: Petition of Entergy Nuclear Vermont Yankee for a Certificate of Public Good*, Docket No. 6812). Analyzed the economic benefits of nuclear plant generating capacity expansion as required for an application for a Certificate of Public Good.
- Submitted expert testimony on behalf of Central Illinois Lighting Company in an Illinois Commerce Commission proceeding (*Re: Central Illinois Lighting Company*, Docket No. 02-0837). Analyzed and developed recommendation for the appropriate return on equity, capital structure, and overall cost of capital.
- Submitted expert testimony on behalf of Arkansas Oklahoma Gas Corp. in a Arkansas Public Service Commission proceeding (*In the Matter of the Application of Arkansas Oklahoma Gas Corporation for a General Change in Rates and Tariffs*, Docket No. 02-24-C).

Analyzed and developed recommendation for the appropriate return on equity, capital structure, and overall cost of capital.

- Submitted expert testimony on behalf of Citizens Utilities in a Vermont Public Service Board proceeding (*Tariff Filing of Citizens Communications Company requesting a rate increase in the amount of 40.02% to take effect December 15, 2001*, Docket No. 6596). Analyzed the prudence and economic used-and-usefulness of Citizens' long-term purchase of generation from Hydro Quebec, including the estimated environmental costs and benefits of the purchase.
- Submitted expert testimony on behalf of Dynegy LNG Production, LP in a FERC proceeding (*Re: Dynegy LNG Production Terminal, LP*, Docket No. CP01-423-000). September 2001. Analyzed market power impacts of proposed LNG facility development.
- Submitted expert testimony on behalf of Missouri Gas Energy Corp. in a FERC proceeding (*Re: Kansas Pipeline Corporation*, Docket No. RP99-485-000). Performed gas supply analysis to determine pipeline depreciation rates as part of an overall rate proceeding.
- Submitted expert testimony on behalf of Green Mountain Power Corp. in a Vermont Public Service Board proceeding (*In the Matter of Green Mountain Power Corporation requesting a 12.93% Rate Increase to take effect January 22, 1999*, Docket No. 6107). Analyzed the appropriate discount rate, treatment of environmental costs, and the treatment of risk and uncertainty as part of a major power-purchase agreement with Hydro-Quebec.
- Submitted expert testimony on behalf of the United Illuminating Company in a Connecticut Dept. of Public Utility Control proceeding (*Application of the United Illuminating Company for Recovery of Stranded Costs*, Docket No. 99-03-04). Developed and applied decision analysis models to estimate nuclear plant stranded costs.
- Submitted expert testimony on behalf of Green Mountain Power Corp. in a Vermont Public Service Board proceeding (*Investigation into the Department of Public Service's Proposed Energy Efficiency Utility*, Docket No. 5980). Analyzed distributed utility planning methodologies and environmental costs.
- Submitted expert testimony on behalf of Green Mountain Power Corp. in a Vermont Public Service Board proceeding (*Tariff Filing of Green Mountain Power Corporation requesting a 16.7% Rate Increase to take effect 7/31/97*, Docket No. 5983). Analyzed distributed utility planning methodologies and avoided electricity costs.

- Submitted expert testimony on behalf of Green Mountain Power Corp. in a Vermont Public Service Board proceeding (*Tariff Filing of Green Mountain Power Corporation requesting a 16.7% Rate Increase to take effect 7/31/97*, Docket No. 5983). Analyzed the prudence and economic used-and-usefulness of a long-term power purchase contract with Hydro-Quebec.

Other litigation

- *Catamount/Brownell, LLC v. Randy Rowland, et al.*, May 2003. Prepared an expert report on the damages associated with breach of commercial lease.
- *Lyubner v. Sizzling Platters, Inc*, September 2002. Performed an econometric analysis of damage claims based on sales impacts associated with advertising.
- *John C. Lincoln Hospital v. Maricopa County*, September 2002. Perfomed statistical analysis to determine the value of a class of unpaid hospital claims.
- *Pietro v. Pietro*, June 2002. Estimated pension benefits arising from a divorce case.
- *Nat'l. Association of Electric Manufacturers v. Sorrell, et al.* September 1999. Testified on the costs of labeling fluorescent lamps and the impacts of labeling laws on the demand for electricity.

Professional experience

Prior to joining Bates White, Dr. Lesser was President of New England Economics Group. Previously, he has served in senior management roles as the Director of Regulated Planning with the Vermont Department of Public Service, Senior Managing Economist at Navigant Consulting, Inc., and Senior Economist and Manager, Economic Analysis, at Green Mountain Power Corporation. In addition, Dr. Lesser was a Lecturer at the School of Business Administration at the University of Vermont and an Adjunct Associate Professor at the College of Business and Economics at Saint Martin's College. He started his career as an Economic Analyst at the Idaho Power Company and as an Energy Economist at the Pacific Northwest Utilities Conference Committee.

Education

- Ph.D., Economics, University of Washington
- M.A., Economics, University of Washington
- B.S., Mathematics and Economics (with honors), University of New Mexico

Professional activities

- Reviewer, *Journal of Regulatory Economics*
- Reviewer, *The Energy Journal*
- Reviewer, *Northwest Journal of Business and Economics*
- Reviewer, *Contemporary Economic Policy*

Professional associations

- Energy Bar Association
- Society of Utility and Regulatory Financial Analysts
- International Association for Energy Economics

Publications

Peer-reviewed journal articles

- Lesser, J.A.: "The Economic Used-and-Useful Test: Its Origins and Implications for a Restructured Electric Industry," *Energy Law Journal*, 23, 349–382 (November 2002).
- Lesser, J.A., and C. Feinstein: "Electric Utility Restructuring, Regulation of Distribution Utilities, and the Fallacy of "Avoided Cost" Rules." *Journal of Regulatory Economics*, 15, 93–110 (January 1999).
- Lesser, J.A., and C. Feinstein: "Defining Distributed Utility Planning," *The Energy Journal*, Special Issue, Distributed Resources: Toward a New Paradigm, 41–62 (1998).
- Lesser, J.A., and R. Zerbe: "What Can Economic Analysis Contribute to the Sustainability Debate?" *Contemporary Policy Issues*, 13, 88–100 (July 1995).
- Lesser, J.A., and R. Zerbe: "The Discount Rate for Environmental Projects," *Journal of Policy Analysis and Management*, 13, 140–156 (Winter 1994).
- Lesser, J.A., and D. Dodds: "Can Utility Commissions Improve on Environmental Regulations?" *Land Economics*, 70, 63–76 (February 1994).
- Lesser, J.A.: "Estimating the Economic Impacts of Geothermal Resource Development," *Geothermics*, 24, 52–69 (Winter 1994).
- Lesser, J.A.: "Application of Stochastic Dominance Tests to Utility Resource Planning Under Uncertainty," *Energy*, 15, 949–961 (December 1990).

- Lesser, J.A.: "Resale of the Columbia River Treaty Downstream Power Benefits: One Road From Here to There," *Natural Resources Journal*, 30, 609–628 (July 1990).
- Lesser, J.A., and J. Weber: "The 65 M.P.H. Speed Limit and the Demand for Gasoline: A Case Study for the State of Washington," *Energy Systems and Policy*, 13, 191–203 (July 1989).
- Lesser, J.A.: "The Economics of Preference Power," *Research in Law and Economics*, 12, 131–151 (1989).

Books and contributed chapters

- Lesser, J.A., and L.R. Giacchino, Fundamentals of Electric and Natural Gas Regulation, Public Utility Reports, forthcoming (2007).
- Lesser, J.A., and R. Zerbe: "A Practitioner's Guide to Benefit-Cost Analysis," in F. Thompson (ed.) Handbook of Public Finance. New York: Rowan and Allenheld, 221–268 (1998).
- Lesser, J.A., D. Dodds, and R. Zerbe: Environmental Economics and Policy, Reading: MA: Addison Wesley Longman, (1997).

Trade press publications

- Lesser, J.A., "Command-and-Control Still Lurks in Every Legislature," *Natural Gas & Electricity* 23, 8-12 (February 2007).
- Lesser, J.A., and G. Israilevich, "The Capacity Market Enigma," *Public Utilities Fortnightly*, 147, 38–42 (December 2005).
- Lesser, J.A., "Overblown Promises: The Hidden Costs of Symbolic Environmentalism," *Livin' Vermont* 1, 7,27 (January/February 2005).
- Lesser, J.A., "Regulation by Litigation," *Public Utilities Fortnightly*, 145, 24–29 (October 2004).
- Lesser, J.A.: "ROE: The Gorilla is Still at the Door," *Public Utilities Fortnightly*, 145, 19–23 (July 2004).
- Lesser, J.A., and S. Chapel: "Keys to Transmission and Distribution Reliability," *Public Utilities Fortnightly*, 144, 58–62 (April 2004).
- Lesser, J.A.: "DCF Utility Valuation: Still the Gold Standard?" *Public Utilities Fortnightly*, 142, 14–21 (February 15, 2003).

- Lesser, J.A.: "Welcome to the New Era of Resource Planning: Why Restructuring May Lead to More Complex Regulation, Not Less," *The Electricity Journal*, 15, 20–28 (July 2002).
- Lesser, J.A., and C. Feinstein: "Identifying Applications for Distributed Generation: Hype vs. Hope," *Public Utilities Fortnightly*, 140, 20–28 (June 1, 2002).
- Lesser, J.A., et al.: "Utility Resource Planning: The Need for a New Approach," *Public Utilities Fortnightly*, 140, 24–27 (January 15, 2002).
- Lesser, J.A.: "Distribution Utilities: Forgotten Orphans of Electric Restructuring?" *Public Utilities Fortnightly*, 137, 50–55 (March 1, 1999).
- Lesser, J.A.: "Regulating Distribution Utilities in a Restructured World," *The Electricity Journal*, 12, 40–48 (January/February 1999).
- Lesser, J.A.: "Is it How Much or Who Pays? A Response to Rothkopf," *The Electricity Journal*, 10, 17–22 (December 1997).
- Lesser, J.A., and M. Ainspan: "Using Markets to Value Stranded Costs," *The Electricity Journal*, 9, 66–74 (October 1996).
- Lesser, J.A.: "Economic Analysis of Distributed Resources: An Introduction," *Proceedings*, First Annual Conference on Distributed Resources, Electric Power Research Institute, Kansas City, MO, (July 1995).
- Lesser, J.A.: "Distributed Resources as a Competitive Opportunity: The Small Utility Perspective," *Proceedings*, First Annual Conference on Distributed Resources, Electric Power Research Institute, Kansas City, MO, (July 1995).
- Lesser, J.A., and M. Ainspan: "Retail Wheeling: Deja vu All Over Again?" *The Electricity Journal*, 7, 33–49 (April 1994).
- Lesser, J.A.: "An Economically Rational Approach to Least-Cost Planning: Comment," *The Electricity Journal*, 4 (October 1991).
- Lesser, J.A., and J. Weber: "Energy Efficiency in New Zealand: Issues and Appropriate Institutions for the Electricity Sector," Report to the New Zealand Ministry of the Environment, (June 1992).
- Lesser, J.A.: "Long-Term Utility Planning Under Uncertainty: A New Approach," Paper presented for the Electric Power Research Institute: ***Innovations in Pricing and Planning***, (May 1990).

- Lesser, J.A.: "Centralized vs. Decentralized Resource Acquisition: Implications for Bidding Strategies," *Public Utilities Fortnightly*, (June 1990).
- Lesser, J.A.: "Most Value—The Right Measure for the Wrong Market?" *The Electricity Journal* 2, 47–51 (December 1989).
- Lesser, J.A., et al.: "Global Warming: Implications for Energy Policy," Washington State Energy Office, Energy Policy and Planning Research Series (July 1989).

Selected speaking engagements

- "Energy in the Northeast: Resource Adequacy & Reliability," Law Seminars International, Boston, MA, October 16–17, 2006.
- "Energy in the Southwest: New Directions in Energy Markets and Regulations," Law Seminars International, Santa Fe, NM, July 14, 2006.
- "Energy and the Environment," Vermont Journal of Environmental Law, South Royalton, VT, March 10, 2006.
- "Electricity and Natural Gas Regulation: An Introduction," Law Seminars International, Washington, DC, March 17–18, 2005.

Earnings Growth Rates

	Company	Symbol	Zack's	I/B/E/S	Value Line	DOE/EIA GDP	BCFF Long-term GDP	Avg. Zack's, VL, I/B/E/S	Avg. BCFF, DOE/EIA GDP
			[1]	[2]	[3]	[4]	[5]	[6]	[7]
1	Allete Inc	ALE	5.00%	5.00%	7.00%	4.86%	5.37%	5.67%	5.11%
2	Alliant Energy	LNT	4.00%	6.00%	5.50%	4.86%	5.37%	5.17%	5.11%
3	DTE Energy	DTE	5.70%	5.67%	3.00%	4.86%	5.37%	4.79%	5.11%
4	Duke Energy	DUK	6.00%	6.02%	9.50%	4.86%	5.37%	7.17%	5.11%
5	MDU Resources	MDU	8.00%	7.15%	8.00%	4.86%	5.37%	7.72%	5.11%
6	Otter Tail	OTTR	4.50%	5.00%	4.00%	4.86%	5.37%	4.50%	5.11%
7	Vectren	VVC	4.50%	4.00%	3.00%	4.86%	5.37%	3.83%	5.11%
8	Xcel Energy	XEL	5.00%	6.20%	6.00%	4.86%	5.37%	5.73%	5.11%
	Average		**5.34%**	**5.63%**	**5.75%**	**4.86%**	**5.37%**	**5.57%**	**5.11%**
	ITC Holdings	ITC	16.00%	14.60%	n/a	4.86%	5.37%	15.30%	5.11%

Notes:

[1] Source: Zack's Investment Research, http://www.zacks.com, as of 2/19/07

[2] Source: I/B/E/S on-line, as of 2/28/07

[3] Source: Value Line Investment Survey, Individual Company Reports.

[4] Source: USDOE/EIA Annual Energy Outlook 2007

[5] Source: BCFF, Volume 25(12), Dec 2006

[6] = Average of [1], [2], and [3]

[7] = Average of [4] and [5]

FERC-approved One-Stage DCF Model Results (Electric Utilities)

	Company	Symbol	6-Months Dividend Yield (Low)	6-Months Dividend Yield (High)	Growth (br+sv)	Growth (IBES)	Adjusted Dividend Yield (Low)	Adjusted Dividend Yield (High)	ROE (Low)	ROE (High)
			[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
1	Allete Inc	ALE	3.08%	3.22%	6.63%	5.00%	3.16%	3.33%	8.16%	9.96%
2	Alliant Energy	LNT	2.92%	3.15%	4.91%	6.00%	2.99%	3.24%	7.90%	9.24%
3	DTE Energy	DTE	2.47%	2.59%	2.31%	5.67%	2.49%	2.66%	4.80%	8.33%
4	Duke Energy	DUK	6.55%	6.86%	2.76%	6.02%	6.64%	7.06%	9.40%	13.08%
5	MDU Resources	MDU	4.41%	4.73%	9.82%	7.15%	4.57%	4.97%	11.72%	14.78%
6	Otter Tail	OTTR	3.62%	3.81%	3.87%	5.00%	3.69%	3.91%	7.56%	8.91%
7	Vectren	VVC	4.29%	4.49%	2.65%	4.00%	4.35%	4.58%	7.00%	8.58%
8	Xcel Energy	XEL	3.87%	4.03%	4.11%	6.20%	3.95%	4.16%	8.06%	10.36%
	ITC Holdings	ITC	2.74%	3.01%	8.49%	14.60%	2.86%	3.23%	11.35%	17.83%

Average	9.24%
Minimum	7.56%
Maximum	14.78%
Median	8.74%
Midpoint	11.17%

Notes:

[1] Equals annual dividend divided by 6-months low stock price ending 2/28/2007

[2] Equals annual dividend divided by 6-months high stock price ending 2/28/2007

[3] Source: Value Line Investment Survey (Calculation is summarized in "Earnings Growth (br+sv)" Tab)

[4] Source: IBES

[5] Equals [1]*(1+0.5*MIN([3],[4]))

[6] Equals [2]*(1+0.5*MAX([3],[4]))

[7] Equals MIN([3],[4]) plus [5]

[8] Equals MAX([3],[4]) plus [6]

Constant Growth, Quarterly DCF Model Results

	Company	Symbol	Current Quarterly Dividends $D_{0,1}$	$D_{0,2}$	$D_{0,3}$	$D_{0,4}$	Annual Dividend	Stock Price 2/28/2007	Current Dividend Yield	Next Scheduled Dividend Payment Date	Time Until Next Payment (years)	Earnings Growth Rate	Quarterly DCF ROE
	[1]						[2]	[3]	[4]	[5]	[6]	[7]	
1	Allete Inc	ALE	$ 0.363	$ 0.363	$ 0.363	$ 0.363	$ 1.452	$48.29	3.01%	3/1/2007	0.0028	5.67%	9.02%
2	Alliant Energy	LNT	$ 0.288	$ 0.288	$ 0.288	$ 0.288	$ 1.152	$39.06	2.95%	5/15/2007	0.2083	5.17%	8.37%
3	DTE Energy	DTE	$ 0.515	$ 0.515	$ 0.515	$ 0.515	$ 2.060	$46.98	4.38%	4/15/2007	0.1250	4.79%	9.60%
4	Duke Energy	DUK	$ 0.310	$ 0.310	$ 0.310	$ 0.320	$ 1.250	$19.61	6.37%	3/15/2007	0.0417	7.17%	14.57%
5	MDU Resources	MDU	$ 0.127	$ 0.127	$ 0.135	$ 0.135	$ 0.524	$26.06	2.01%	4/1/2007	0.0861	7.72%	10.00%
6	Otter Tail	OTTR	$ 0.288	$ 0.288	$ 0.288	$ 0.288	$ 1.152	$32.72	3.52%	3/1/2007	0.0028	4.50%	8.37%
7	Vectren	VVC	$ 0.305	$ 0.305	$ 0.305	$ 0.315	$ 1.230	$28.19	4.36%	3/1/2007	0.0028	3.83%	8.60%
8	Xcel Energy	XEL	$ 0.215	$ 0.223	$ 0.223	$ 0.223	$ 0.884	$23.71	3.73%	4/15/2007	0.1250	5.73%	9.86%
	ITC Holdings	ITC	$ 0.263	$ 0.263	$ 0.275	$ 0.275	$ 1.075	$43.33	2.48%	3/15/2007	0.0417	15.30%	18.46%

Average	**9.80%**
Minimum	**8.37%**
Maximum	**14.57%**
Median	**9.31%**
Midpoint	**11.47%**

Notes:

[1] MISO Group utilities

[2] Source: Value Line Investment Survey, Individual Company Reports.

[3] Source: Daily closing stock prices, Thomson Financial; Equals average of previous 30 days' closing prices

[4] Equals [2] / [3]

[5] Source: Based on a combination of Thomson's dividend payment dates and individual company Annual Reports

[6] Elapsed time calculated as date from "calculation date" until next scheduled dividend payment date [5]

[7] Equals average, I/B/E/S, Zack's, and Value Line earnings growth rates

Calculation Date: 2/28/2007

Constant Growth, Quarterly DCF Model Results

Using FERC Stock Prices

	Company	Symbol	Current Quarterly Dividends $D_{0,1}$	$D_{0,2}$	$D_{0,3}$	$D_{0,4}$	Annual Dividend	2/28/2007 Stock Price	Current Dividend Yield	Next Scheduled Dividend Payment Date	Time Until Next Payment (years)	Earnings Growth Rate	Quarterly DCF ROE
	[1]						[2]	[3]	[4]	[5]	[6]	[7]	
1	Allete Inc	ALE	$ 0.363	$ 0.363	$ 0.363	$ 0.363	$ 1.452	$46.14	3.15%	3/1/2007	0.0028	5.67%	9.18%
2	Alliant Energy	LNT	$ 0.288	$ 0.288	$ 0.288	$ 0.288	$ 1.152	$38.14	3.02%	5/15/2007	0.2083	5.17%	8.45%
3	DTE Energy	DTE	$ 0.515	$ 0.515	$ 0.515	$ 0.515	$ 2.060	$45.60	4.52%	4/15/2007	0.1250	4.79%	9.75%
4	Duke Energy	DUK	$ 0.310	$ 0.310	$ 0.310	$ 0.320	$ 1.250	$18.67	6.70%	3/15/2007	0.0417	7.17%	14.96%
5	MDU Resources	MDU	$ 0.127	$ 0.127	$ 0.135	$ 0.135	$ 0.524	$25.11	2.09%	4/1/2007	0.0861	7.72%	10.08%
6	Otter Tail	OTTR	$ 0.288	$ 0.288	$ 0.288	$ 0.288	$ 1.152	$31.04	3.71%	3/1/2007	0.0028	4.50%	8.58%
7	Vectren	VVC	$ 0.305	$ 0.305	$ 0.305	$ 0.315	$ 1.230	$28.00	4.39%	3/1/2007	0.0028	3.83%	8.64%
8	Xcel Energy	XEL	$ 0.215	$ 0.223	$ 0.223	$ 0.223	$ 0.884	$22.39	3.95%	4/15/2007	0.1250	5.73%	10.11%
	ITC Holdings	ITC	$ 0.263	$ 0.263	$ 0.275	$ 0.275	$ 1.075	$37.71	2.85%	3/15/2007	0.0417	15.30%	18.94%

Average	9.97%
Minimum	8.45%
Maximum	14.96%
Median	9.47%
Midpoint	11.71%

Notes:

[1] MISO Group utilities

[2] Source: Value Line Investment Survey, Individual Company Reports.

[3] Source: Daily closing stock prices, Thomson Financial; Equals average of previous 6 months' closing prices

[4] Equals [2] / [3]

[5] Source: Based on a combination of Thomson's dividend payment dates and individual company Annual Reports

[6] Elapsed time calculated as date from "calculation date" until next scheduled dividend payment date [5]

[7] Equals average, I/B/E/S, Zack's, and Value Line earnings growth rates

Calculation Date. 2/28/2007

Summary of Proxy Group Company Financial Data

	Stock Symbol	Company	Value Line Date of Value Line Report	Value Line VL Market Capitalization (Small, Mid, Large)	Value Line VL Market Capitalization 2006 (Millions)	Value Line VL Safety Rank	Regulated Revenues 10-K (2006) Total Company Revenues (Millions)	10-K (2006) Regulated Total Company Revenues	10-K (2006) Regulated Total Company Revenues (Pct.)
1	ALE	Allete, Inc	12/29/2006	Mid	$1,400	2	767.1	$638	83%
2	LNT	Alliant Energy Corp	12/29/2006	Mid	$4,500	3	$3 359	$3,156	94%
3	DTE	DTE Energy Company	12/29/2006	Large	$8,600	3	$9,022	$6,586	73%
4	DUK	Duke Energy Corp	12/1/2006	Large	$39,000	2	$15,184	$12,026	79%
5	MDU	MDU Resources Group, Inc	2/9/2007	Mid	$4,700	1	$4 071	$889	22%
6	OTTR	Otter Tail Corp	12/29/2006	Small	$900	2	$1 105	$306	28%
7	VVC	Vectren Corp	12/29/2006	Mid	$2,200	2	$2,042	$1,655	81%
8	XEL	Xcel Energy Inc.	2/9/2007	Large	$9,500	2	$9,840	$8,764	89%
	Averages				$8,850	2.13	$5,674	$4,378	77%
	ITC	ITC Holdings Corp.					$224	$224	100%

Data Sources: Value Line Investment Survey; Standard & Poors; Individual Company 10-K and Annual Reports.

Summary of Proxy Group Company Financial Data

									Capital Structures			
			Value Line	10-K (2006)	10-K (2006)	10 K (2006)	10-K (2006)	10-K (2006)	10-K (2006)		10-K (2006)	10-K (2006)
	Stock Symbol	Company	Date of Value Line Report	Total Capitalization ($ Million)	Long-Term Debt ($Million)	Short-Term Debt ($/$Million)	Preferred Stock	Common Equity	LT Debt (%)	ST Debt (%)	Preferred (%)	Common (%)
				Assum(B:E)	B	C	D	E	F=B/A	G=C/A	H=D/A	I=E/A
1	ALE	Allete, Inc	12/29/2006	$828	$360	$30	$0	$439	43.4%	3.6%	0.0%	53.0%
2	LNT	Alliant Energy Corp	12/29/2006	$4,582	$1,323	$373	$244	$2,651	28.8%	8.1%	5.3%	57.7%
3	DTE	DTE Energy Company	12/29/2006	$14,808	$7,474	$1,485	$0	$5,849	50.5%	10.0%	0.0%	39.5%
4	DUK	Duke Energy Corp	12/1/2006	$46,275	$18,118	$2,055	$0	$26,102	39.2%	4.4%	0.0%	56.4%
5	MDU	MDU Resources Group, Inc	2/9/2007	$3,418	$1,171	$84	$15	$2,150	34.2%	2.5%	0.4%	62.9%
6	OTTR	Otter Tail Corp	12/29/2006	$804	$255	$42	$16	$491	31.8%	5.2%	1.9%	61.1%
7	VVC	Vectren Corp.	12/29/2006	$2,871	$1,208	$489	$0	$1,174	42.1%	17.0%	0.0%	40.9%
8	XEL	Xcel Energy Inc	2/9/2007	$13,334	$6,450	$963	$105	$5,817	48.4%	7.2%	0.8%	43.6%
	Averages			$10,868	$4,545	$680	$47	$6,584	38.8%	7.3%	1.1%	51.8%
	ITC	ITC Holdings Corp.		$1,794	$1,262	$0	$0	$532	70.3%	0.0%	0.0%	29.7%
							market cap	$1,859				
								60%				

Data Sources: Value Line Investment Survey, Standard & Poors; Individual Company 10-K and Annual Reports.

Summary of Proxy Group Company Financial Data

	Stock Symbol	Company	Value Line Date of Value Line Report	Credit Ratings and Betas: Standard & Poor's S&P Long-Term Issuer Credit Rating	Value Line Dividends Steady or Increasing since 2002?	Value Line Beta
1	ALE	Allete, Inc	12/29/2006	BBB+	Increasing	0.90
2	LNT	Alliant Energy Corp	12/29/2006	BBB+	Increasing	0.95
3	DTE	DTE Energy Company	12/29/2006	BBB	Increasing	0.75
4	DUK	Duke Energy Corp	12/1/2006	BBB	Increasing	1.30
5	MDU	MDU Resources Group, Inc	2/9/2007	BBB+	Increasing	1.00
6	OTTR	Otter Tail Corp	12/29/2006	BBB+	Increasing	0.85
7	VVC	Vectren Corp.	12/29/2006	A-	Increasing	0.90
8	XEL	Xcel Energy Inc	2/9/2007	BBB	Increasing	0.90
	Averages					0.92
	ITC	ITC Holdings Corp.		BBB		

Data Sources: Value Line Investment Survey, Standard & Poors; Individual Company 10-K and Annual Reports.

Tuck School of Business
at Dartmouth

No. 03-111

Understanding Risk and Return, the CAPM, and the Fama-French Three-Factor Model

RISK AND RETURN

The General Concept: Higher Expected Returns Require Taking Higher Risk

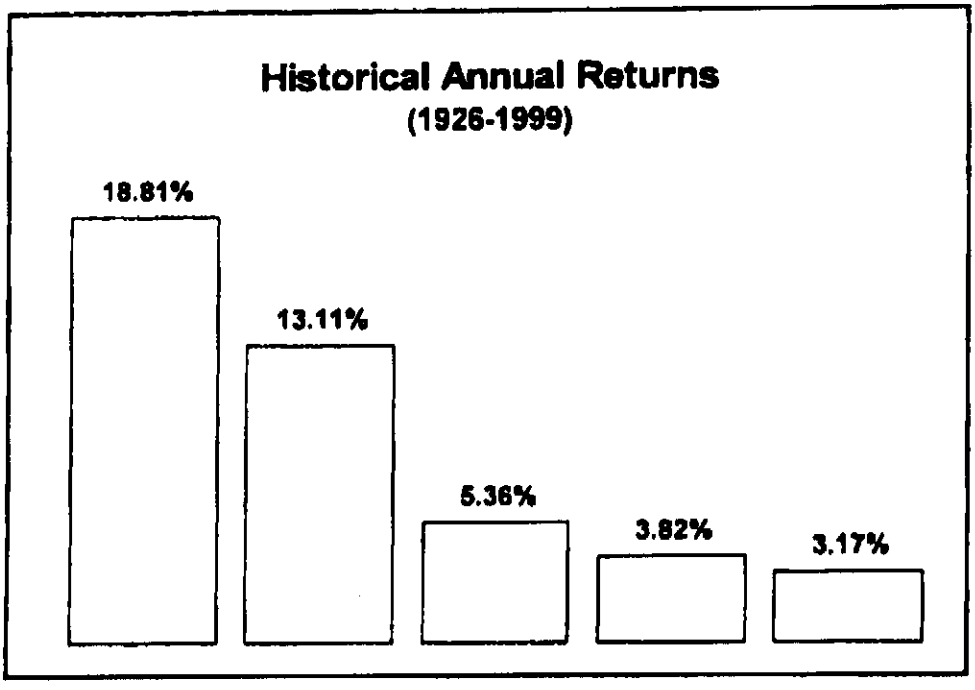
Most investors are comfortable with the notion that taking higher levels of risk is necessary to expect to earn higher returns. In this note, we explain two important models that have been developed to make this relationship precise. Then we explain how such tools can be used by investors to evaluate assets such as mutual funds.

Why should riskier companies have higher returns? Intuitively, an investor would require a higher *expected* return in exchange for accepting greater risk. And, we do, in fact observe this relationship when we look back at historical long-run returns of stocks, bonds, and less risky securities as shown in the first chart.

To understand this, imagine an investment that is expected to generate $1 million per year in perpetuity. How much is someone likely to pay for such an asset? The answer depends on the uncertainty or riskiness of the cash flows. With complete certainty that the cash flows will all be paid when promised, an investor would discount the asset at the risk-free rate. As the degree of uncertainty increases, the return required to justify the risk will be much higher, resulting in a much lower price the investor would be willing to pay, simply because of the higher required discount rate.

Furthermore, economists have made the assumption that investors are risk-averse, meaning that they are willing to sacrifice some return (and accept even less than the expected present value of the future returns) to reduce risk. If this assumption is true, we would expect investors to demand a higher return to justify the additional risk accepted by holders of riskier assets.

This case note was written under the direction of Kent Womack and Ying Zhang by Adam Borchert, Lisa Ensz, Joep Knijn, Greg Pope, and Aaron Smith. We would appreciate suggestions to make the exposition more clear or correct. Send them to Kent.Womack@Dartmouth.Edu



Source: Stocks, Bonds, Bills and Inflation 2002 Yearbook, 2002 Ibbotson Associates

Volatility as a Proxy for Risk

One widely accepted measure of risk is volatility, the amount that an asset's return varies through successive time periods, and is most commonly quoted in terms of the standard deviation of returns. An asset whose return fluctuates dramatically is perceived to have greater risk because the asset's value at the time when the investor wishes to sell it is less predictable. In addition, greater volatility means that, from a statistical perspective, the potential future values of more volatile assets span a much wider range.

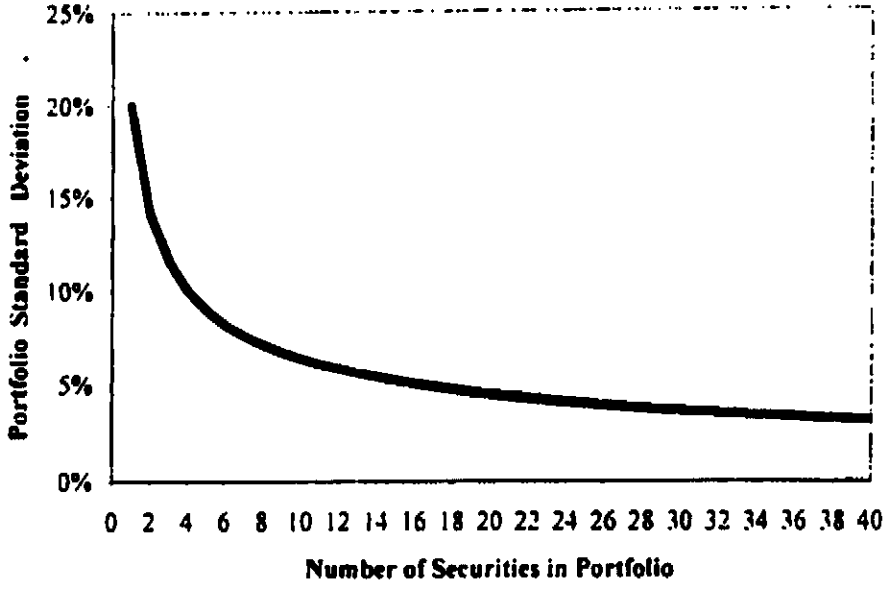
Diversification and Systematic Risk

Although somewhat counterintuitive, an individual stock's volatility in and of itself, is not the most important consideration when assessing risk. Consider a situation in which an investor could, without incurring additional cost, reduce the volatility associated with her portfolio of assets. This is most commonly accomplished through diversification. Consider holding two stocks that have the same expected returns, instead of one stock. Because stock returns will not be perfectly correlated with each other, it is unlikely that both stocks will experience extreme movements (positive or negative) simultaneously, effectively reducing volatility of the overall portfolio. As long as assets do not move in lock step with one another (are less than perfectly

positively correlated), overall volatility can be reduced, without lowering expected returns, by spreading the same amount of money across the multiple assets.

This concept of diversification is one of the main tenets of modern portfolio theory – volatility is reduced through the addition of more assets to a portfolio. It should be noted, however, that the rate of volatility reduction from adding assets decreases as the number of assets in the portfolio increases. As the chart below demonstrates for one potential scenario (20% volatility on each asset and zero covariance between assets), the general rule of thumb is that a portfolio containing 30 or more assets is considered well-diversified.

Diversifying Reduces Portfolio Volatility



Volatility can be effectively reduced without significant cost by diversifying, so it makes sense that investors should not be compensated for that portion of volatility which is merely stock specific and has no impact on a well diversified portfolio. This type of volatility is called *unsystematic risk* in the finance literature because it does not covary with the market as a whole, but is merely the additional random "noise" present in that specific asset's returns. Since this random noise has an expected return of zero, it can be diversified away by adding more securities to the portfolio. Its mean will be zero, and its standard deviation will be reduced as more assets are added.

The logical extension of this argument is that with enough assets in a portfolio, the portfolio volatility matches that of the overall market. Thus, investors should only expect to be compensated for the risk that cannot be diversified away (i.e. the *systematic risk*).

Beta as a Measure of Systematic Risk

As mentioned above, an asset exhibits both systematic and unsystematic risk. The portion of its volatility which is considered systematic is measured by the degree to which its returns vary relative to those of the overall market. To quantify this relative volatility, a parameter called beta was conceived as a measure of the risk contribution of an individual security to a well diversified portfolio:

$$\beta_i = \frac{\mathrm{cov}(r_i, r_M)}{\sigma_M^2}$$

where

r_i is the return of the asset

r_M is the return of the market

σ_M^2 is the variance of the return of the market, and

$\mathrm{cov}(r_i, r_M)$ is covariance between the return of the market and the return of the asset.

In practice, beta is calculated using historical returns for both the asset and the market, with the market portfolio being represented by a broad index such as the S&P 500 or the Russell 2000. This type of data is widely available from financial databases and can be downloaded into software packages like Excel or SPSS for easy manipulation.

To determine the beta of a portfolio, we simply average the individual securities' betas, weighted by the market capitalization of each security.

The next section describes how such a measure of risk can be used in a model to describe the relationship between systematic risk and expected return.

CAPM

Key Assumptions Drive the Formulation of the Model

The Capital Asset Pricing Model (CAPM) attempts to quantify the relationship between the beta of an asset and its corresponding expected return. The CAPM model makes a number of simplifying assumptions, of which the most relevant to this note are about investor behavior and the presence of a single common risk factor.

The first assumption is that investors care only about expected returns and volatility. Therefore, as rational consumers, they will always maximize expected return for any given level of expected volatility. Second, all investors have homogeneous beliefs about the risk/reward tradeoffs in the market.

The third assumption is that only one risk factor is common to a broad-based market portfolio. This risk factor is the systematic market risk which drives non-diversifiable volatility. Investors are assumed to hold diversified portfolios, as the market does not reward investors for the bearing of diversifiable risk. As a result, the CAPM states that if a security's beta is known, it is possible to calculate the corresponding expected return.

Logic of the Model: Developing Intuition

To build the intuition for this model, first consider an asset that has no volatility, and thus, no risk; thus, its returns do not vary with the market. As a result, the asset has a beta equal to zero and an expected return equal to the risk-free rate.

Next, consider an asset that moves in lock-step with the market, or has a beta of one. As a result of this perfect correlation with the market, this asset, by definition, earns a return equal to that of the market. $E(r_i) = E(r_M)$

Lastly, think about an asset that experiences greater swings in periodic returns than the market, or has a beta greater than one. We would expect this asset to earn returns superior to those of the market as compensation for this extra risk.

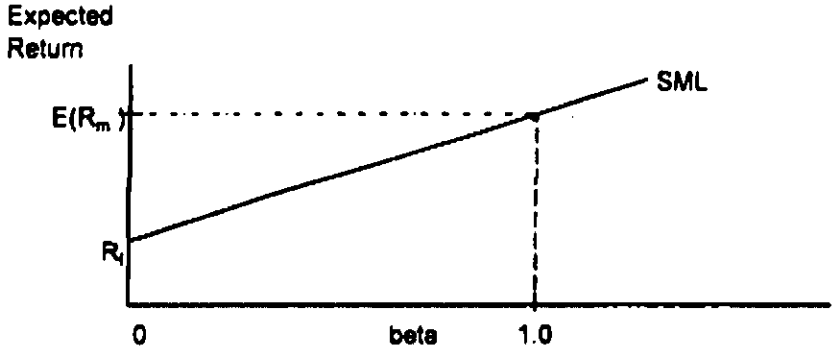
If we generalize this relationship between expected returns on assets and their exposure to market risk, we are led to the CAPM equation:

$$E(r_i) = r_f + \beta_i (E(r_M) - r_f)$$

where r_f is the risk-free rate, and

$(E(r_M) - r_f)$ is the expected excess return of the market portfolio beyond the risk-free rate, often called the equity risk premium.

Essentially, the CAPM states that an asset is expected to earn the risk-free rate plus a reward for bearing risk as measured by that asset's beta. The chart below demonstrates this predicted relationship between beta and expected return – this line is called the Security Market Line.



In plain English, beta is the ratio of the expected excess return of an asset relative to the overall market's excess return, where excess return is defined as the return on any given asset less the return on a risk-free asset. For example, a stock with a beta of 1.5 would be expected to have an excess return of 15% in a time period where the overall market beat the risk-free asset by 10%. Effectively, beta is a numerical way to express the idea that expected returns are more sensitive to market swings for those assets that are highly covariant with the market.

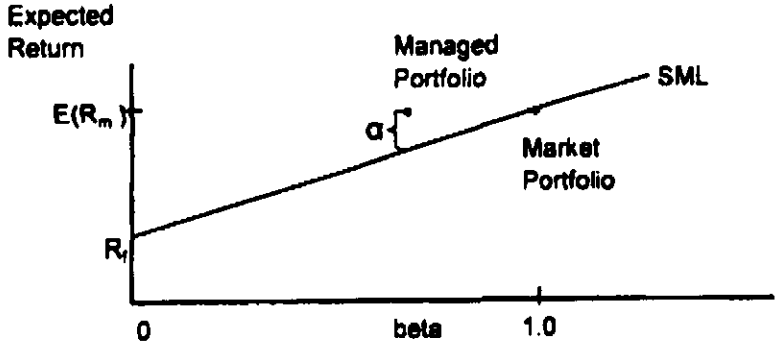
The CAPM as a Tool to Evaluate Fund Managers

Given that the CAPM predicts what a particular asset or portfolio's expected return should be relative to its risk and the market return, the CAPM can also be used to evaluate the performance of active fund managers.

Active fund managers try to outperform the market by selecting stocks in a portfolio based on research and informed opinions. One of the key questions surrounding realized returns is whether the manager of the fund is actually achieving a return higher than what would be predicted by the risk the manager took. The CAPM model gives us an estimate of what the return should have been, given the beta risk of the portfolio. If the realized return is greater than the predicted return from the CAPM model, this points toward "adding value;" if the manager has lower or equivalent returns, she might be "just collecting fees" but adding no investment value.

Based on our previous discussion of risk/return tradeoffs, we can see that one way for a manager to increase the expected return on a given fund is to invest in positions that embody greater systematic risk. In effect, by accepting more variance, the manager can increase the beta (and thus the portfolio risk) of the fund and thereby increase her expected returns.

While some investors may choose to accept greater risk to increase expected returns, real value comes from a mutual fund manager who is able to deliver higher returns at the same or reduced level of risk. Essentially, we are asking if the manager is able to create a portfolio which would have higher returns than those predicted by the CAPM. Compare the realized return of a portfolio with its expected return predicted by CAPM. The difference is "excess return", which is often referred to as "α" (or, alpha). Graphically, if α is greater than zero, this portfolio would lie above the Security Market Line. The presence or absence of a positive alpha can be used to evaluate a manager's performance.



Regression Analysis: A Tool for Employing the CAPM

In order to discern whether a manager should be credited with adding value, we can analyze the manager's portfolio using the CAPM model and regression.

In our case, we would like to know how the return on a particular asset or portfolio changes with respect to the return of the market. We need three time series of data to run this regression. First, we need returns (usually monthly) for the stock whose beta we are calculating for a significant period of time (often 3 or 5 years). Second, we need returns on the overall market index for the same period. Finally, we need risk free returns for the same time period as well. Not surprisingly, the equation looks very similar to the CAPM equation introduced above:

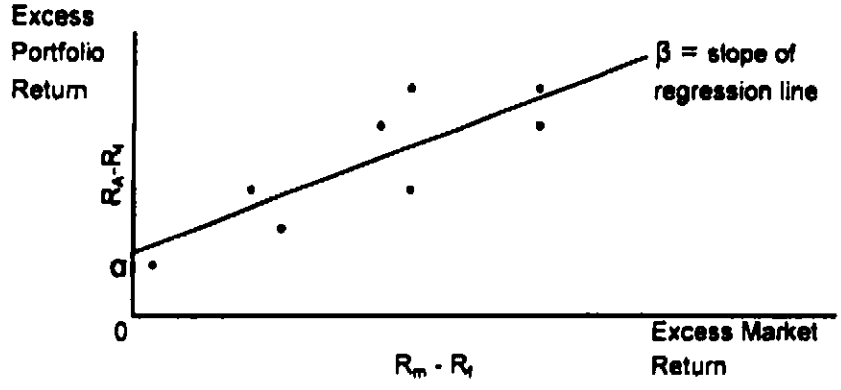
$$r_i = r_f + \beta_i(r_M - r_f) + \alpha$$

Note the addition of alpha, to represent the potential value addition of a fund manager. Furthermore, notice that the beta term in the regression formula is equivalent to the beta term introduced earlier, and is calculated in the same manner.

By rearranging the terms slightly, we will be able to run a regression and determine whether α is indeed reliably positive or not. To run the test, we set up the data as excess returns, subtracting the r_f term from both sides of the equation.

$$r_i - r_f = \alpha + \beta_i(r_M - r_f)$$

Now the equation takes the familiar form of a linear model and we can regress historically realized excess fund (or, individual stock) returns against historically observed excess market returns. Effectively, regression takes a scattered set of points on a graph and determines the line which most closely fits those points. Beta is the slope of this line. Alpha, the vertical intercept, indicates how much better the fund did than the CAPM predicted. Graphically, this is shown as:



The regression line is expected to pass through the origin if alpha is zero, and alpha can be negative in some cases.

Critique of the CAPM

While the CAPM is an extremely elegant and useful tool, there are concerns about the overall efficacy of the model. Several key criticisms have come to the fore of academic research in recent years:

The CAPM's true predictive power is questionable. When realized returns are compared to what the CAPM would have expected, we find that the model is often incorrect. We find that CAPM models usually achieve an R^2 measure of only about 0.85. While this relatively high R^2 value is one of the main reasons for the popularity of the CAPM, it also highlights the fact that roughly 15% of the variation in observed returns still remains unexplained.

In addition, many researchers believe that other risk factors have significant impact on expected returns in the market. As a result, the simplicity of the CAPM's assumption of a single risk factor explaining expected returns has been called into question.

These critiques are in many ways interrelated; improvements in any one of these areas are bound to have an effect on others. Because the predictive and explanatory power of the CAPM is bound by the structure of the model, it is the assumption of a single risk factor which has spurred much recent academic research into security price analysis.

Additional Factors Increase Predictive Power

It is obvious that there are a myriad of risk factors facing companies today. Some of these factors are market risk, bankruptcy risk, currency risk, supplier risk, etc.; and given that the CAPM uses a single factor to describe aggregate risk, it seems logical that a model including more sub-factors might provide a more descriptive and predictive model. Effectively, additional factors allow more specific attribution of the risks to which a company is exposed. The single risk factor can be decomposed along multiple dimensions.

Furthermore, from a statistical perspective, the addition of independent variables to a regression often improves the explanatory power of a model. For these reasons, multifactor models relax the assumption and constraint of a single risk factor and look for other factors that affect expected return to assets.

As a result of the many hypotheses regarding various risk factors, and the abundance of data available regarding publicly traded stocks, a great deal of research has been performed with the goal of identifying additional risk factors that have robust predictive capability.

FAMA AND FRENCH AND THE THREE FACTOR MODEL

Size and Value Factors Create Additional Explanatory Power

Renowned researchers Eugene Fama and Ken French have done extensive research in this area and found factors describing "value" and "size" to be the most significant factors, outside of market risk, for explaining the realized returns of publicly traded stocks. To represent these risks, they constructed two factors: SMB to address size risk and HML to address value risk. Fama

and French first published their findings on these factors in 1992 and have continued to refine their work since.

The SMB and HML Factors

The SMB Factor: Accounting for the Size Premium

SMB, which stands for Small Minus Big, is designed to measure the additional return investors have historically received by investing in stocks of companies with relatively small market capitalization. This additional return is often referred to as the "size premium."

In practice, the SMB monthly factor is computed as the average return for the smallest 30% of stocks minus the average return of the largest 30% of stocks in that month. A positive SMB in a month indicates that small cap stocks outperformed large cap stocks in that month. A negative SMB in a given month indicates the large caps outperformed. As with the CAPM, when performing historical analysis, we use computed SMB factors for each time period, most commonly monthly; and for predictive purposes (computing an "alpha" excess return), we use either the historical average of the factor or a well informed guess as to the current size premium. As points of reference, the historical average from July 1926 to July 2002 of the annual SMB factor has been approximately 3.3%[1]; and in a recent lecture, Ken French stated that he believes the annual SMB premium to be in the range of 1.5-2.0% today[2].

The HML Factor

HML, which is short for High Minus Low, has been constructed to measure the "value premium" provided to investors for investing in companies with high book-to-market values (essentially, the value placed on the company by accountants as a ratio relative to the value the public markets placed on the company, commonly expressed as B/M).

Constructed in a fashion similar to that of SMB, HML is computed as the average return for the 50% of stocks with the highest B/M ratio minus the average return of the 50% of stocks with the lowest B/M ratio each month. A positive HML in a month indicates that value stocks outperformed growth stocks in that month. A negative HML in a given month indicates the growth stocks outperformed. Over the time period from 1926 to 2002, this premium for value stocks has averaged approximately 5.1% annually[3], and was recently cited by Ken French as having a current value of approximately 3.5-4.0%[4].

Interpretations of the Factors

In reality, the SMB and HML factors first drew attention and continue to be the most commonly used simply because they work—they have the greatest predictive power of any two additional factors that researchers have tested –often yielding an R^2 value of approximately 0.95. That being said, causal explanations for SMB are appealing from a theoretical perspective, but for HML, the labeling of it as a "risk factor" has spurred much discussion.

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[1] Lecture note "The cross-section of expected returns", Investments Course Fall 2003, Ken French
[2] Investments Course Fall 2003 Review Session, November 3, 2003
[3] Lecture note "The cross-section of expected returns", Investments Course Fall 2003, Ken French
[4] Investments Course Fall 2003 Review Session, November 3, 2003

For SMB, which is a measure of "size risk", small companies logically should be expected to be more sensitive to many risk factors as a result of their relatively undiversified nature and their reduced ability to absorb negative financial events.

On the other hand, the HML factor suggests higher risk exposure for typical "value" stocks (high B/M) versus "growth" stocks (low B/M). This makes sense intuitively because companies need to reach a minimum size in order to execute an Initial Public Offering; and if we later observe them in the bucket of high B/M, this is usually an indication that their public market value has plummeted because of hard times or doubt regarding future earnings. Since these companies have experienced some sort of difficulty, it seems plausible that they would be exposed to greater risk of bankruptcy or other financial troubles than their more highly valued counterparts.

Constructing the Three Factor Model

By combining the original market risk factor and the newly developed factors, we have the commonly used Fama French Three Factor Model. Analogous to the CAPM, this model describes the expected return on an asset as a result of its relationship to three risk factors: market risk, size risk, and "value" risk.

$$r_i = r_f + \beta_i(r_M - r_f) + s_i SMB + h_i HML$$

The coefficients in this model have similar interpretations to beta in the CAPM above. β_i is a measure of the exposure an asset has to market risk (although this beta will have a different value from the beta in a CAPM model as a result of the added factors). s_i measures the level of exposure to size risk and h_i measures the level of exposure to value risk.

SMB and HML Provide Added Descriptive Dimensions for Riskiness

A primary implication of the Three Factor Model is that investors can choose to weight their portfolios such that they have greater or lesser exposure to each of the specific risk factors, and therefore can target more precisely different levels of expected return.

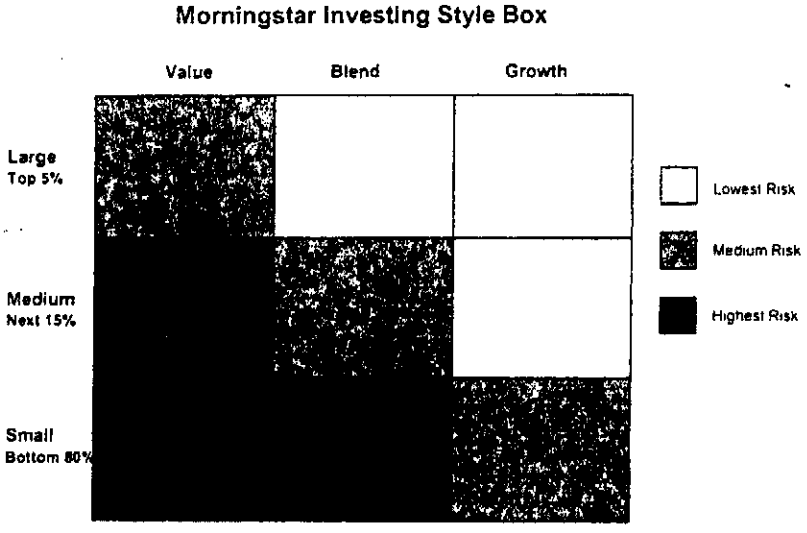
Categorizing Funds with the Three Factor Model

One compelling feature of the Three Factor Model is that it provides a way to categorize mutual funds by the size and value risks to which its portfolio is exposed, and thus the return premiums expected, as a result of the assets held. Utilizing this classification provides two main benefits.

Classifying Funds into Style Buckets

We can effectively compare managers by placing them in broad buckets based on the style of asset allocation they choose in constructing their portfolios. For this purpose, funds are often plotted on a 3x3 matrix, demonstrating the relative amount of risk represented by the different strategies.

The mutual fund rating company Morningstar is the biggest resource for mutual fund classification. Funds are separated horizontally into three roughly equal groups through a B/M ranking (value ranking). Independently, funds are also separated vertically based on a ranking of market capitalization (size ranking), bucketed according to the percentages listed below.

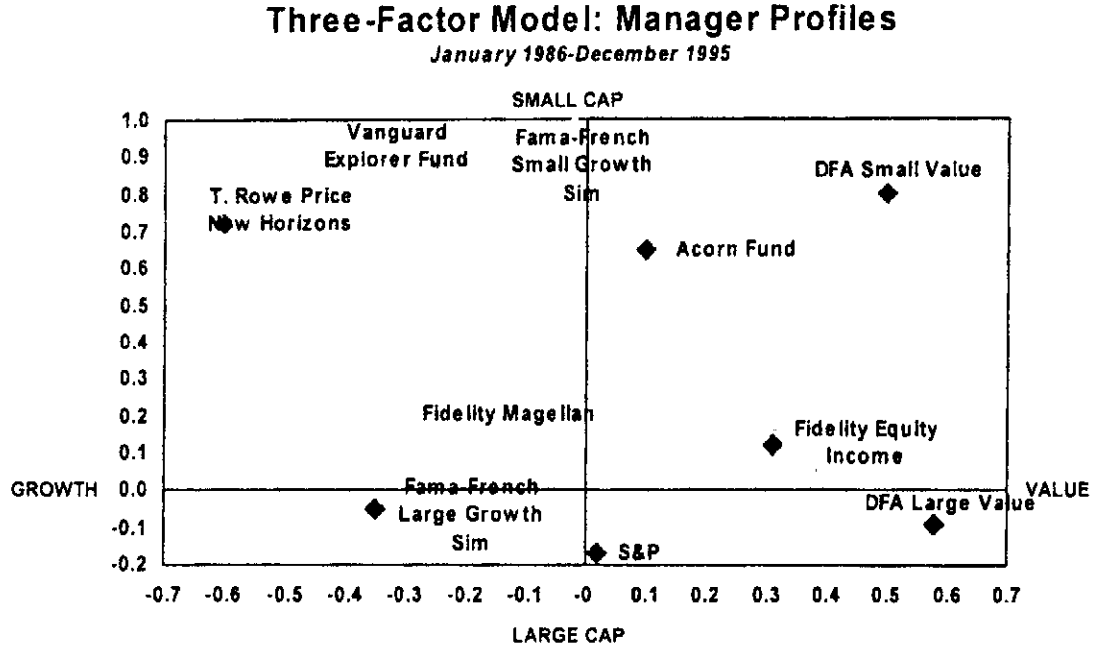


Interestingly, the Morningstar classification of a fund is often different from what the fund claims as its official strategy, indicating the value of independent verification.

Specifying Risk Factor Exposure Informs Investor Choice

The second use of the Three Factor Model in categorizing funds is that investors can effectively choose the amount to which they are exposed to each risk factor when investing in particular funds. In practice, this characterization is executed through multivariate regression. The historical returns of a particular portfolio are regressed against the historical values of the three factors, generating estimates of the coefficients.

Funds can then be categorized much more granularly, as presented below:



Source: Fama, Eugene. "Asset Management. Engineering Portfolios for Better Returns". *Senior Consultant*. May 1998.

With just these few funds we can see they cover the spectrum of possible strategies described by the Three Factor Model.

Multivariate Regression and Evaluating Managers with the Three Factor Model

Now that we've seen the ability of the Three Factor Model both to classify mutual funds and to demonstrate the ability of investors to choose exposure to certain risk factors, the logical extension is to apply these inferences to the historical performance of fund managers and further refine our ability to determine the amount of value added by management.

In practice, this exercise is merely an extension of the evaluation process described above with respect to the CAPM, but now we need five time series of returns and factors. As mentioned earlier, we first need (usually monthly) returns for the stock whose beta we are calculating for a significant period of time (often 3 or 5 years). Second, we need returns on the overall market index for the same period. Third, we need risk free returns for the same time period as well. Fourth and fifth, we need the calculated factors for SMB and HML for each of the months. We manipulate the Three Factor Model in the same fashion, subtracting the risk-free rate from each side of the equation and introducing the same concept of alpha (i.e., excess return) to yield the equation:

$$r_A - r_f = \alpha + \beta_A(r_M - r_f) + s_A SMB + h_A HML$$

At this point, we can utilize historical data in a multivariate regression to determine the value of alpha and the statistical likelihood that it is materially different from zero as measured by the relevant t-statistic. A reliably positive measure of alpha would indicate that the mutual fund

manager is adding value to the portfolio, beyond merely allocating investments to provide varying degrees of exposure to the three risk factors.

Ultimately, the benefit of regression with the Three Factor Model is two-fold when compared to the simpler CAPM version. First, the Three Factor Model explains much more of the variation observed in realized returns, displaying R^2 values of 0.95 and higher. Second, the Three Factor Model often exposes the fact that a positive alpha observed in a CAPM regression is merely a result of exposure to either HML or SMB factors, rather than actual manager performance.

Fund Evaluation in Practice (1) – Legg Mason (using CAPM)
The Legg Mason Value Prim fund returned 27.3% annually from September 1982 to December 1986 while the market only returned 21.6%. The fund manager might claim the excess returns were due to her exceptional ability at picking stocks. Armed with the CAPM and regression, we are able to evaluate the fund manager's claim of superior performance.

Using historical monthly values for r_A, r_M and r_f, we can determine the values of α and β using the analysis described above. Using $r_A - r_f$ for the y-values and $r_M - r_f$ for the x-values in a regression, the following coefficients are returned:

α = 0.46% per month
β = 0.93

The CAPM considers only one-dimensional market risk, so the realized returns must come from either the fund's exposure to market risk or the value added by the manager. The monthly returns that can be attributed to the manager's ability are captured in alpha. The results imply the fund manager was able to add 46 basis points to the fund's return on a monthly basis or about 5.5% per year above the return expected from a portfolio with a beta of .93. The key question is whether she just got lucky or was really able to add value. The t-statistic associated with alpha is 2.37, indicating that achieving such returns without skill would be extremely unlikely probabilistically. The remainder of the realized returns was due to the fund's exposure to market risk or factors not included in the model. Finally, the R^2 of 0.89 tells us that 89% of the variance of the returns experienced were explained by our model.

It would seem from the results above that the manager had, during that time frame, the ability to increase the fund's return beyond the fund's risk exposure, according to the CAPM.

Note that it is conventional in analyzing securities to use monthly return data, but that there is no specific statistical reason other than simple convenience. If we were to use different time periods in delimiting our analysis we would reach approximately the same results.

Fund Evaluation in Practice (2) – Legg Mason Revisited (using the Three Factor Model)
Using the CAPM, our manager was able to support her claim that she could add 46 basis points monthly. We now have another tool with which to scrutinize this claim. We again utilize historic monthly values to build a regression. In this case, we use r_A, r_M, r_f, SMB, and HML. We can

now regress $r_A - r_f$ against $r_M - r_f$, SMB and HML to determine the values of α, β, s_A and h_A using the equation described above. The following coefficients result:

$\alpha = 0.22$
$\beta = 0.99$
$s_A = 0.36$
$h_A = 0.22$

The new results imply the fund manager was able to add only 22 basis points on a monthly basis. While this alpha is less than we saw with the CAPM, it would still seem she added significant value on an annualized basis. The relatively low t-statistic of 1.1, however, undermines her claim and indicates that the alpha was more likely to have happened by chance (i.e. it is not statistically different from zero).

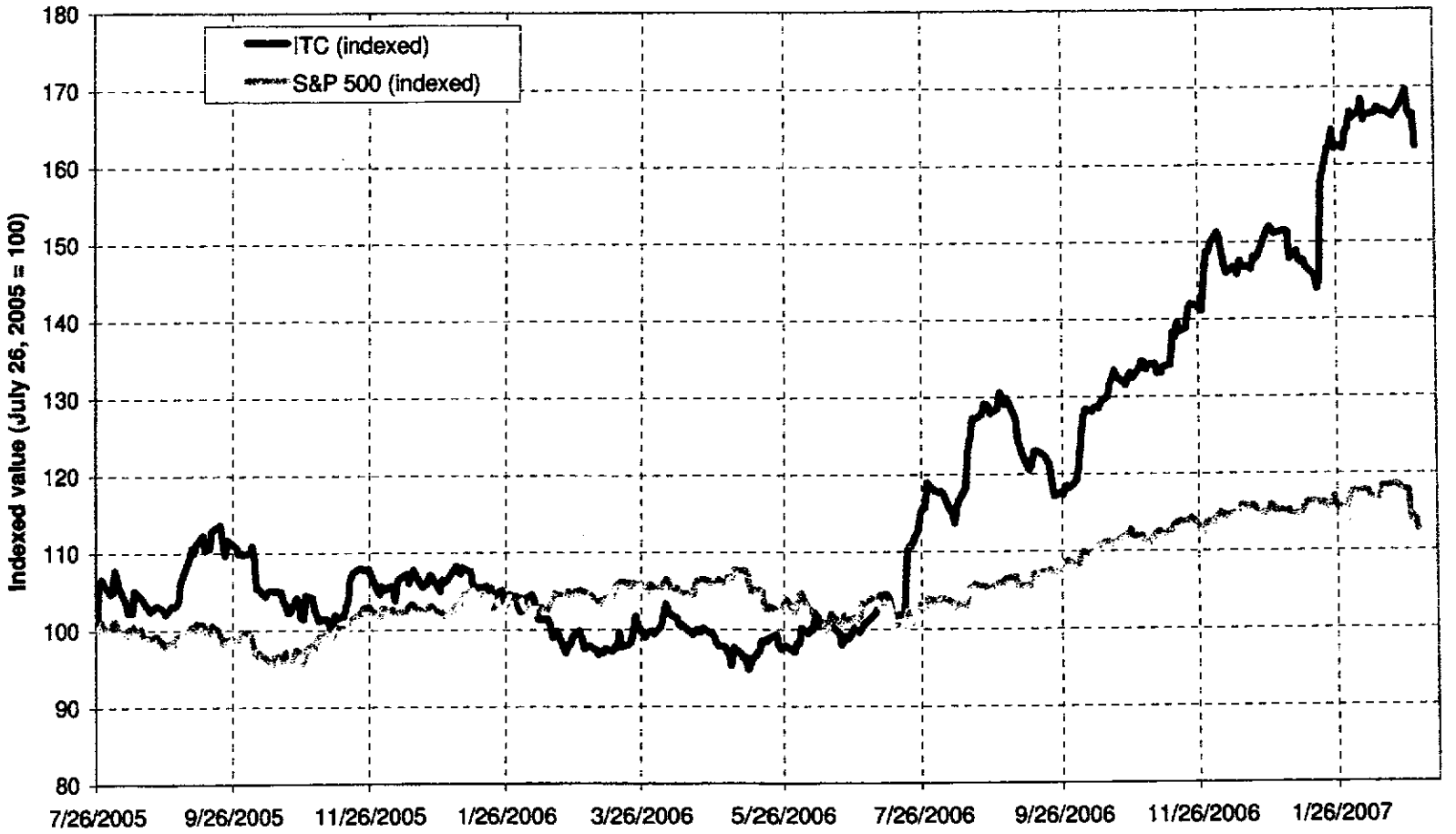
The high returns are associated with the fund's exposure to size and value risk rather than the skill of the manager. Finally, the increased R^2 (to 0.92) tells us that the three factors explain all but 8% of the variation in historical returns, further lending credence to the findings.

CONCLUSION

We have examined two tools to help investors understand the risk/reward tradeoff which they face when making investments. We first introduced the CAPM, with its inherent simplicity, linking market covariance risk to expected returns. Its simplicity helps to build intuition around the concept of modeling return as a function of risk. The CAPM's simplicity is also its greatest shortcoming, as the underlying assumptions limit its ability to explain and predict actual returns. The Fama-French Three-Factor Model expands the capabilities of the model by adding two company specific risk factors - SMB and HML. The three factors in concert explain most of the returns due to risk exposure.

Both models have many important uses. Two uses discussed in this note are the ability to categorize investments depending on how their returns vary with different risk factors and to evaluate an active manager's performance independent of her fund's risk exposure. With these tools, investors are able to make more informed investment decisions with respect to personal preference regarding the risk/reward tradeoff.

Historical stock prices for ITC Holdings and S&P 500
(July 26, 2005-March 2, 2007)



Summary of Analysis Results, MISO Group Utilities and ITC Holdings

	Company	FERC DCF Low	FERC DCF High	QDCF	QDCF / FERC Stock Prices	FP Model
1	Allete Inc	8.16%	9.96%	9.02%	9.18%	
2	Alliant Energy	7.90%	9.24%	8.37%	8.45%	
3	DTE Energy	4.80%	8.33%	9.60%	9.75%	
4	Duke Energy	9.40%	13.08%	14.57%	14.96%	
5	MDU Resources	11.72%	14.78%	10.00%	10.08%	
6	Otter Tail	7.56%	8.91%	8.37%	8.58%	
7	Vectren	7.00%	8.58%	8.60%	8.64%	
8	Xcel Energy	8.06%	10.36%	9.86%	10.11%	
	ITC Holdings	**11.35%**	**17.83%**	**18.46%**	**18.94%**	**14.50%**

	MISO Group Utilities			ITC
Average	**9.54%**	**9.80%**	**9.97%**	**16.64%**
Minimum	**7.00%**	**8.37%**	**8.45%**	**11.35%**
Maximum	**14.78%**	**14.57%**	**14.96%**	**18.94%**
Median	**8.74%**	**9.31%**	**9.47%**	**18.14%**
Midpoint	**10.89%**	**11.47%**	**11.71%**	**15.14%**