Bershad, Specthrie & Lerach, San Diego, California, attorneys representing the WPPSS bondholders, to evaluate economic issues associated with financial instruments. Deposition testimony April 1988.

Laureys v. Commissioner. Retained by Ted Kletnick, Internal Revenue Service, New York to evaluate the economic risk involved in option straddle transactions. Report filed December 1987. Trial testimony April 1988.

OPTIONS, FUTURES AND DERIVATIVE SECURITIES

State Fund Mutual Insurance Company v. Bear Stearns et. al. Retained by Terry Fruth of Fruth and Anthony on behalf of State Fund Insurance to analyze the damage sustained by State Fund from the purchase of interest only mortgage strips. The work also included an analysis of the riskiness of interest only strips. Arbitration testimony, October 1996.

Chairman, Los Angeles Blue Ribbon Commission on City Investments. Appointed by Mayor Riordan to serve as Chairman of a Blue Ribbon Commission to examine the City's four major funds: the City Treasurer's fund and the pension funds for Police and Fire, City Employees and Water and Power. The Commission was asked to pay particular attention to the risks associated with investment in derivative securities. Commission meetings, March 1995.

SEC, CFTC v. Kemper Financial Services Inc. Retained by Ann Tighe of Cotsirilos, Stehpenson, Tighe & Streicker, attorneys for Kemper Financial, to analyze the relation between trading in S&P 500 futures contracts and underlying equity securities across a number of funds managed by Kemper.

ContiCommodity Services Litigation. Retained by David T. Pritikin of Sidley & Austin, attorneys for Continental Grain, to evaluate the economic impact of trades in government securities and related futures contracts. Declaration May 1989. Trial testimony March 1992. Jury awarded Continental Grain $137 million in damages. Subsequently retained by Mike Clark, the U.S. attorney, to testify in a criminal trial related to the same trading. Trial testimony August 1992. The defendant was found guilty.

Ferruzzi Group v. Chicago Board of Trade. Retained by Larry Hunt of Sidley & Austin, attorneys for Ferruzzi, to evaluate the impact of Ferruzzi's soybean trading on the world market for soybeans in the summer of 1989. Declaration July 1990. Testimony in a hearing at the Chicago Board of Trade December 1990. Case settled March 1992.

Hunt v. IRS; U.S. Tax Court, Washington, D.C. Retained by Lawrence Fossi and Ewing Werling of Vinson & Elkins, Dallas, attorneys for Nelson Bunker Hunt, to analyze the value of loans, collateralized by futures contracts between members of the family of Nelson B. Hunt. Expert report submitted November 1987. Trial testimony January 1988.

UTILITY LITIGATION AND THE COST OF CAPITAL

Cost of Capital Associated with the Leasing of Unbundled Elements of the Regional Bell Operating Companies' Local Exchange Networks. Retained by AT&T, M.C.I., and a number of the companies' law firms to analyze the cost of capital for the RBOCs associated with the business of leasing unbundled elements to AT&T and other companies as part of the Telecommunications Act of 1996. Deposition and testimony in numerous states, Fall 1996. Written testimony was filed in additional states and a white paper was also prepared.

Merger of Pacific Telesis and Southwestern Bell. Retained by Jerry Thayer of the California Public Utilities Commission on behalf of the Division of Rate Payer Advocates to analyze the financial impact on rate payers of the proposed merger of Pacific Telesis and SBC. Report on the value of the benefits due to rate payers, September 1996.

Spin-off of Air Touch Cellular. Retained by Jerry Thayer of the California Public Utilities Commission on behalf of the Division of Rate Payer Advocates to analyze the financial impact on rate payers of the spin-off of Air Touch Cellular from Pacific Telesis. Testimony before Administrative Law Judge, March 1994.

Kern River Cost of Capital Study. Retained by Kathryn Edwards of Travis & Gooch on behalf of gas producers who ship their product through the Kern River Gas Pipeline to estimate the cost of equity capital for the pipeline. Report on the cost of capital March 1993. Testimony at the Federal Energy Regulatory Commission, December 1993.

Columbia Gas Transmission Company Bankruptcy. Retained by David Bennett of Thompson and Knight on behalf of a consortium of natural gas producers in the Southwest to estimate the appropriate discount rate to use when discounting bankruptcy claims that arose when Columbia defaulted on long-term natural gas contracts with the producers. Declaration May 1993. Arbitration testimony August 1993.

Study of the Valuation of Rate Base Regulated Utilities. Commissioned by a consortium of counties in the State of California to examine the relation between market value and various cost based measures of value for regulated telecommunications firms. The purpose of the study was to determine whether a systematic relation exists which can be relied upon in the determination of fair market value.

TA6-307 by Kuparuk Transportation Company. Retained by Terry Bird of Nutter, Bird, Marella, Boxer, Wolpert & Matz, Los Angeles, attorneys for the State of Alaska, to evaluate the appropriate rate of return on a crude oil pipeline in Alaska. Expert witness report filed September 1987.

Southern Union v. New Mexico Gas Consumers Class Action. Retained by John Spiegel of Morrison & Foerster, San Francisco, attorneys for Southern Union, to analyze the effect of a natural gas pricing agreement on the stock prices of several gas producers. Deposition testimony February and July 1984.

REAL ESTATE

Equitec Rollup Litigation. Retained by John Millian of Gibson, Dunn & Crutcher on behalf of Dean Witter to analyze the impact of a rollup on the value of a group of limited partnerships. Deposition May 1993. Declaration June 1993. Trial testimony March 1994.

ATTACHMENT 3

BRADFORD CORNELL
Professor of Financial Economics
Anderson Graduate School of Management

Personal Information

Birth date:	November 20, 1947
Marital status:	Married, 5 children
UCLA address:	Anderson Graduate School of Management UCLA Los Angeles, California 90024 (310) 825-2922
Business address:	FinEcon 10877 Wilshire Boulevard, Suite 710 Los Angeles, California 90024 (310) 208-2827

Education

Ph.D. Financial Economics, Stanford University, 1975
M.S. Statistics, Stanford University, 1974
A.B. (Interdepartmental) Physics, Philosophy and Psychology, Stanford University, 1970

Teaching Positions & Professional Positions

1987-Present:	Professor of Finance and Director of the Bank of America Research Center, Anderson Graduate School of Management, UCLA
1990-Present:	President, FinEcon: Financial Economic Consulting
1988-1990:	Vice-President and Director of the Securities Litigation Group, Economic Analysis Corporation
1979-1986:	Assistant and Associate Professor of Finance, UCLA
1983-1984:	Visiting Professor of Finance, California Institute of Technology
1977-1979:	Assistant Professor of Finance, University of Southern California
1975-1977:	Assistant Professor of Finance, University of Arizona

Courses Taught

Information Systems and Corporate Valuation
The Law and Finance of Corporate Acquisitions and Restructurings
Corporate Financial Theory
The Theory of Finance in the UCLA Law School
Security Valuation and Investments
A wide variety of executive and community education programs

Special Education Programs Include

The U.S. Business School in Prague - Special Finance Program, Summer 1991
The Nissan Program for Historically Black Colleges, Director, Summer 1989
The Lead Program for Business Education of Minority High School Students, 1987-Present

Consulting and Professional Activities

Selected Service at UCLA

Twice chairman of finance department
Twice Vice-Chairman of the Anderson School
Three time member of the staffing and promotion committee

Service to Scholarly Journals and Organizations

Served as an associate editor for a variety of scholarly and business journals including: the *Journal of Finance*, *Journal of International Business Studies*, *Journal of Business and Economics*, *Journal of Financial Research*, *Journal of Futures Markets*, and the *Investment Management Review*.

Served as a reviewer for numerous finance and economics journals including: the *American Economic Review, Journal of Political Economy, Journal of Financial Economics, Journal of Business, Journal of Financial and Quantitative Analysis,* and the *Review of Economics and Statistics.*

Memberships in Professional Societies

American Finance Association 1973-Present
  Member of Board of Directors, 1987-1989
Western Finance Association 1973-Present
  Member of Board of Directors, 1982-1985
  Vice-President, 1987
American Economic Association 1973-Present
American Statistical Association 1992-Present
International Association of Financial Engineers 1993-Present
American Law and Economics Association 1995-Present
Human Behavior and Evolution Society 1995-Present

Research Evaluation

Project reviewer for the National Science Foundation: 1979-Present
Program committee for the Western Finance Association: 1982-1988

Selected Board and Committee Memberships

Chairman, Mayor Riordan's Blue Ribbon Commission on Los Angeles' Muncipal Investments
Pension Policy Board, The Aerospace Corporation: 1985-Present
Forms Engineering Corporation: 1976-Present
Trustee, Kellow Trust: 1982-1991

Selected Consulting Clients

Merrill Lynch (Obtained futures brokers license, owned a seat of the International Monetary Market of the Chicago Mercantile Exchange)
Chase Manhattan Bank
Thrifty Corporation
Wynn Oil
Resorts International

Expert Witness

Numerous cases involving the application of financial economics

Media Experience

Occasional author for the *Wall Street Journal* and the *Los Angeles Times*
Occasional commentator for local television and radio stations
Lecturer on valuation theory, appraisal practice and securities pricing

Books

Cornell, B., 1996, **Social Decoding and Ethnic Discrimination**, revising draft for possible publication by the University of Chicago Press.

Cornell, B., 1994, **Corporate Valuation**, in *Handbook of Modern Finance*, Third Edition, Dennis Logue ed., Warren Gorham Lamont,, Boston, MA.

Cornell, B., 1993, **Corporate Valuation: Tools for Effective Appraisal and Decision Making**, Business One Irwin, New York, NY.

Academic Articles

Cornell, B. and A.E. Bernardo, 1996, **The Valuation of Complex Derivatives by Major Investment Firms: Empirical Evidence**, *Journal of Finance*, (forthcoming)

Cornell, B. and I. Welch, 1996, **Culture, Information and Screening Discrimination**, *Journal of Political Economy*, (forthcoming, June 1996).

Cornell, B., F. Longstaff and E. Schwartz, 1996, **Throwing Good Money After Bad? Cash Infusions and Distressed Real Estate**, *Journal of the American Real Estate and Urban Economics Association*, 24: 23-41.

Cornell, B., 1995, **An Hypothesis Regarding the Origins of Ethnic Discrimination**, *Rationality and Society*, 7 (January): 4-29.

Cornell, B, 1994, **Change Reinforces Use of DCF Method**, *Natural Gas,* 11 (October): 5-15.

Cornell, B., 1993, **Adverse Selection, Squeezes and the Bid-Ask Spread on Treasury Securities**, *Journal of Fixed Income*, 3 (June): 39-47.

Cornell, B. and E. Sirri, 1992, **The Reaction of Investors and Stock Prices to Insider Trading**, *Journal of Finance,* 47 (July): 1031-1059.

Cornell, B., 1992, **Liquidity and the Pricing of Low-grade Bonds**, *Financial Analysts Journal*, 48 (January/February): 63-68.

Cornell, B. and K. Green, 1991, **Measuring the Investment Performance of Low-grade Bond Funds**, *Journal of Finance*, 66 (March): 29-48.

Cornell, B. and G. Morgan, 1990, **Using Finance Theory to Measure Damages in Fraud on the Market Cases**, *UCLA Law Review*, 37 (No. 2): 883-924.

Cornell, B., 1990, **The Incentive to Sue: An Option Pricing Approach**, *Journal of Legal*

Studies, 17 (No. 1): 173-188.

Cornell, B., 1990, **Volume and R^2**, *Journal of Financial Research*, 13 (No. 13): 1-7.

Cornell, B., 1990, **Measuring the Term Premium: An Empirical Note**, *Journal of Economics and Business*, 42 (No. 1): 89-93.

Cornell, B., W. Landsman and A. Shapiro, 1989, **Cross Sectional Regularities in the Reaction of Stock Prices to Bond Rating Changes**, *Journal of Accounting, Auditing and Finance*, 4 (No. 4): 460-479.

Cornell, B. and A. Shapiro, 1989, **The Mispricing of U.S. Treasury Bonds: A Case Study**, *The Review of Financial Studies*, 2 (No. 3): 297-310.

Cornell, B., 1989, **The Impact of Data Errors on Measurement of the Foreign Exchange Risk Premium**, *Journal of International Money and Finance*, 8: 147-157.

Cornell, B. and W. Landsman, 1989, **Security Price Response to Quarterly Earnings Announcements and Analyst Forecast Revisions**, *The Accounting Review*, 64 (October): 680-692.

Cornell, B. and A. Shapiro, 1988, **Financing Corporate Growth**, *Journal of Applied Corporate Finance, 1* (Summer): 6-22.

Cornell, B. and K. Engelmann, 1988, **Measuring the Cost of Corporate Litigation: Five Case Studies,** *Journal of Legal Studies*, 17 (June): 135-162.

Cornell, B. and A. Shapiro, 1987, **Corporate Stakeholders and Corporate Finance**, *Financial Management*, 16 (Spring): 5-14.

Cornell, B., A. Shapiro and W. Landsman, 1987, **The Impact on Bank Stock Prices of Regulatory Responses to the International Debt Crisis**, *Journal of Banking and Finance*, 3: 161-178.

Cornell, B., 1987, **Pricing Interest Rate Swaps: Theory and Empirical Evidence,** Proceeding of Conference on Swaps and Hedges, Saloman Brothers Center, New York University.

Cornell, B., 1987, **Forecasting the Eleventh District Cost of Funds**, *Housing Finance Review*, 6 (Summer): 123-135.

Cornell, B. and K.R. French, 1986, **Commodity Own Rates, Real Interest Rates, and Money Supply Announcements,** *Journal of Monetary Economics*, 18 (July): 3-20.

Cornell, B. and A. Shapiro, 1986, **The Reaction of Bank Stock Prices to the International Debt Crisis**, *Journal of Banking and Finance*, 10: 55-73.

Cornell, B., 1985, **Inflation Measurement, Inflation Risk, and the Pricing of Treasury Bills**, *Journal of Financial Research*, 9 (Fall): 193-202.

Cornell, B. and A. Shapiro, 1985, **Interest Rates and Exchange Rates: Some New Empirical Evidence,** *Journal of International Money and Finance*, 4: 431-442.

Cornell, B., 1985, **The Weekly Pattern in Stock Returns: Cash versus Futures**, *Journal of*

Finance, 40 (June): 583-588.

Cornell, B., 1985, **The Income Approach to Valuation**, *Proceedings of the Wichita State University Conference on the Appraisal of Railroads and Public Utilities.*

Cornell, B. and O. Sand, 1985, **The Value of Rate Base Options in the Eurocredit Market**, *Journal of Bank Research*, 16 (Spring): 22-28.

Cornell, B., 1983, **The Money Supply Announcements Puzzle: Review and Interpretation**, *American Economic Review*, 73 (September): 644-658.

Cornell, B., 1985, **The Money Supply Announcements Puzzle: Reply**, *American Economic Review*, 75 (June): 565-566.

Cornell, B., and K.R. French, 1983, **Taxes and the Pricing of Stock Index Futures**, *Journal of Finance*, 38 (June): 675-695.

Reprinted in *Proceedings of the Seminar for the Analysis of Securities Prices*, University of Chicago Press, 1983.

Cornell, B., 1983, **Money Supply Announcements and Interest Rates: Another View**, *Journal of Business*, 56 (January): 1-25.

Reprinted in *Proceedings of the Seminar for the Analysis of Securities Prices*, University of Chicago Press, 1983.

Cornell, B., 1983, **Monetary Policy and the Daily Behavior of Interest Rates**, *Journal of Business and Economics*, 35: 189-203

Cornell, B. and A. Shapiro, 1983, **Managing Exchange Risk**, *Midland Corporate Financial Journal*, 1 (Fall): 16-31.

Reprinted in *New Developments in International Finance*, Ed. J.M. Stern and D.H. Chew, Basil Blackwell, New York, 1988.

Cornell, B. and K.R. French, 1983, **The Pricing of Stock Index Futures**, *Journal of Futures Markets*, 3 (Fall): 1-14.

Reprinted in *Readings in Futures Markets, Vol. V* and in *Selected Writings on Futures Markets: Explorations in Financial Futures*, both published by the Chicago Board of Trade, 1984.

Cornell, B., 1982, **Money Supply Announcements, Interest Rates, and Foreign Exchange,** *Journal of International Money and Finance*, 1: 201-208.

Cornell, B. and M.R. Reinganum, 1981, **Forward versus Futures Prices: Evidence From the Foreign Exchange Markets**, *Journal of Finance*, 36 (December): 1035-1046.

Cornell, B., 1981, **Taxation and the Pricing of Treasury Bill Futures**, *Journal of Finance*, 36 (December): 1169-1176.

Cornell, B., 1981, **The Relationship Between Volume and Price Variability in Futures Markets**, *Journal of Futures Markets*, 1 (Fall): 303-316.

Cornell, B., 1981, **Relative versus Absolute Price Changes: An Empirical Study,** *Economic Inquiry*, 16 (April): 302-309.

Cornell, B., 1981, **The Consumption Based Asset Pricing Model: A Note on Potential Tests and Applications**, *Journal of Financial Economics*, 9 (March): 103-110.

Cornell, B. and R. Roll, 1981, **Strategies for Pairwise Competitions in Markets and Organizations**, *Bell Journal of Economics*, 12 (Spring): 201-216.

Cornell, B., 1981, **What is the Future for Floating Rate Bonds**, *Chase Financial Quarterly*, 1 (Fall): 27-38.

Cornell, B., 1980, **The Denomination of Foreign Trade Contracts Once Again**, *Journal of Financial and Quantitative Analysis*, 15 (November): 933-945.

Cornell, B., 1980, **Inflation, Relative Price Changes and Exchange Risk**, *Financial Management*, 9 (Spring): 30-35.

Cornell, B., 1979, **Asymmetric Information and Investment Performance Measurement,** *Journal of Financial Economics*, 7 (December): 381-390.

Cornell, B. and D. Capozza, 1979, **Treasury Bill Pricing in the Spot and Futures Markets**, *Review of Economics and Statistics*, 61 (November): 513-520.

Reprinted in *Interest Rate Futures: Concepts and Issues*, Robert Dame, Inc. 1981.

Cornell, B. and D. Capozza, 1979, **A Variance Forecasting Test of the Option Pricing Model**, *Financial Review*, 7: 381-390.

Cornell, B., 1979, **Relative Price Changes and Deviations from Purchasing Power Parity**,

Journal of Banking and Finance, 3: 263-279.

Cornell, B., 1979, **A Note on Capital Asset Pricing and the Theory of Indexed Bonds**, *Southern Journal of Economics*, 45: 1239-1247.

Cornell, B., 1979, **Do Money Supply Announcements Affect Short-term Interest Rates**, *Journal of Money, Credit and Banking*, 11 (February): 80-86.

Cornell, B., 1978, **Risk, Currency Substitution and the Exchange Rate**, *Proceedings of the Fall 1978 Conference*, Federal Reserve Bank of San Francisco.

Cornell, B., 1978, **Determinants of the Bid-Ask Spread on Forward Foreign Exchange Contracts Under Floating Exchange Rates**, *Journal of International Business Studies*, 9 (Fall): 33-41.

Cornell, B., 1978, **Using the Option Pricing Model to Measure the Uncertainty Producing Effect of Major Announcements,** *Financial Management*, 7 (Spring): 54-59.

Cornell, B., 1978, **Price as a Signal of Quality: Some Additional Experimental Results**, *Economic Inquiry*, 16 (April): 302-309.

Cornell, B. and J.K. Dietrich, 1978, **Mean Absolute Deviation versus Least-Square Regression Estimation of Beta Coefficients**, *Journal of Financial and Quantitative Analysis*, 13 (March): 123-131.

Cornell, B., 1978, **Monetary Policy, Inflation Forecasting and the Term Structure of Interest Rates**, *Journal of Finance*, 33 (March): 117-127.

Cornell, B. and J.K. Dietrich, 1978, **The Efficiency of the Market for Foreign Exchange Under Floating Exchange Rates**, *Review of Economics and Statistics*, 60 (February): 111-120.

Cornell, B., 1978, **Option Pricing in Bear and Bull Markets**, *Journal of Portfolio Management*, 4 (Summer): 30-32.

Cornell, B., 1977, **Spot Rates, Forward Rates, and Exchange Market Efficiency**, *Journal of Financial Economics*, 5 (August): 55-65.

Reprinted in *Frontiers in International Financial Management*, Ed. D.R. Lessard, John Wiley, 1979.

Reprinted in *International Finance: Concepts and Issues*, Eds., R.W. Kalb and G.D Gay, Robert F. Dame, 1982.

Cornell, B., 1977, **Measuring the Informational Content of Consumer Price Announcements**, *Nebraska Journal of Economics and Business*, 16 (Summer): 57-64.

Cornell, B., 1977, **Which Inflation Rate Affects Interest Rates**, *Business Economics*, 12 (May): 22-25.

Reprinted in *Certified Financial Analysts Digest*, 1977.

Cornell, B., 1977, **Are Deep Discount Convertibles Underpriced?**, *Journal of Portfolio Management*, 3 (Spring): 55-57.

Cornell, B., 1977, **Using the Goldsmith-Nagan Survey to Estimate the Liquidity Premium**, *Journal of Economics and Business*, 2 (February): 148-151.

Cornell, B., 1976, **Managing Money in a Competitive Securities Market**, *Arizona Review*, 25 (September): 1-5.

Cornell, B., 1976, **Asset Pricing Under Uncertain Inflation: A Note on the Work of Long and Roll**, *Intermountain Economic Review*, 7 (Spring): 85-91.

Cornell, B., 1976, **The Arizona Retirement System 1956-1975: An Investment Analysis**, 25 (March): 1-5.

Book Reviews and Discussion Comments

Cornell, B., 1988, **Statistical Analysis of Price and Basis Behavior: October 12-26, 1987**, in The Stock Market: Bubbles, Volatility, and Chaos, Eds., E.D. Dwyer and R.A. Hafer, Kluwer Academic Publishers, 1990.

Cornell, B., 1985, Review of Futures Markets, edited by Manfred F. Streit, *Journal of Monetary Economics*, 16 (July): 133-135.

Cornell, B., 1985, Review of Exchange Rates and International Macroeconomics, edited by Jacob A. Frenkel, *Journal of International Money and Finance*, 4: 212-214.

Cornell, B., 1983, Review of Exchange Rate Policy, by Ray A. Batchelor and Geoffrey Wood, *Journal of Economic Literature*, 21: 1027-1029.

Working Papers

Cornell, B. and S.C. Cheng, 1995, **Using the DCF Method to Estimate the Cross-Sectional Variation of Expected Returns**.

Cornell, B., 1984, **Testing the Tax Timing Option Theory: A New Approach.**

Cornell, B. and J.K. Dietrich, 1979, **Determinants of Corporate Capital Structure: An Empirical Analysis**.

Awards and Honors

Cited as one of the ten most prolific research authors in the field of finance, in **Most Frequent Contributors To The Finance Literature**, by Jean Louis Heck and Phillip L. Cooley, *Financial Management*, Autumn, 1980.

Financial Management Association Prize for Applied Research: 1987

Institute for Quantitative Research in Finance, Research Grant: 1984
Center for the Study of Futures Markets, Research Grant: 1983
Center for the Study of Futures Markets, Research Grant: 1981
Chicago Mercantile Exchange, Research Grant: 1979

Phi Beta Kappa, Stanford University, 1970

Graduated with distinction, Stanford University, 1970

DECLARATION

I, Bradford Cornell, declare under penalty of perjury that the foregoing is true and correct. Executed on February 13, 1997.

Bradford Cornell

F

Economic Analysis and Rebuttal of LEC Claims of a Depreciation Shortfall

Frederick R. Warren-Boulton

This paper addresses the comments filed by the LECs regarding underdepreciation of LECs' assets due to differences between economic and regulatory measures of depreciation. Upon close examination, I find that LEC estimates of a large depreciation shortfall are unconvincing because they are based on flawed assumptions and misleading comparisons. LEC arguments that the failure to incorporate this alleged depreciation shortfall into the price of exchange access and unbundled network elements (UNEs) will have deleterious effects on investment and competition are also shown to be false. Moreover, I show that the depreciation shortfall claimed by the LECs is a product of LECs' plans to provide new, non-POTS type services, such as broadband. They do not claim the existing network is obsolete for its current services. Rather they assert the network is obsolete because it can't provide other services they want to sell. Under these circumstances, incorporating the depreciation shortfall into exchange access prices would provide a windfall for LECs' shareholders but have harmful effects on competition, prices, and investment in the telecommunications industry.

To determine how well regulatory depreciation practices are performing, it is necessary to a have a benchmark for what depreciation reserves should be at a given point in time. The theoretical reserve is one such benchmark. Based upon current estimates of asset lives and net salvage rates, the theoretical reserve measures what depreciation reserves would be if current asset lives and net salvage rates had been used throughout time. If the book depreciation reserve is less (more) than the theoretical reserve, then there is a reserve deficit (reserve surplus).

Both MiCRA and the LECs have conducted studies to estimate the magnitude of the reserve deficit problem. Whereas MiCRA has estimated that the depreciation shortfall is very small and has been declining over time, the LECs have estimated that the depreciation shortfall is enormous and growing.[1,2] What explains the large difference between these two sets of estimates? The central difference between these two estimates is that MiCRA's estimates were based on the prescribed lives and net salvage values filed

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[1]For the LECs' estimate of the depreciation shortfall, see Jeffery Rohlfs, Charles Jackson, and Ross Richardson. *The Depreciation Shortfall.* USTA Comments, CC Docket No. 96-262 (January 29, 1997), Attachment 15, p. 7.

[2] For MiCRA's estimate of the depreciation shortfall, see Kenneth Baseman and Harold Van Gieson. *Depreciation Policy in the Telecommunications Industry: Implications for Cost Recovery by the Local Exchange Carriers.* Prepared on behalf of MCI Telecommunications Corporation , December, 1995.

by the LECs in their most recent depreciation represcription, whereas the LECs' new estimates of the depreciation shortfall are based upon their new estimates of "economic" lives and net salvage rates, which are far shorter than the lives they proposed just a couple of years ago.[3]

The LECs do discuss in some detail the principles which in their view determine the "economic" life of an asset. It is not these principles that are problematic, but the LECs misapplication of them to the analysis of the alleged depreciation reserve shortfall. SWBT's depreciation expert, John Lube, states that the economic life of an asset is primarily determined by "technology, competition, and customers' demand for new services."[4] These are the same three drivers cited by TFI's Poitras and Vanston in their Appendix B.[5]

The first of these factors, technology, can influence economic life through the introduction of new, superior technology that reduces an asset's value, i.e. via economic obsolescence.[6,7] This naturally raises the question of why there should be a large difference between LEC and regulator estimates of the impact of technology obsolescence since regulators are aware of this problem and have taken steps to make their depreciation practices more forward looking.[8] MiCRA's earlier depreciation study examined this question indirectly. By looking at the source of the difference between company proposed and FCC prescribed depreciation lives in 1995, it was possible to determine that the largest difference (in terms of its impact on the reserve deficit) was in subscriber metallic cable. Why would the LECs want to replace most of their subscriber metallic cable? TFI's studies of technological substitution in the telephone industry provide the answer. TFI predicts that the vast majority of this cable will be replaced rapidly by Fiber in the Loop to enable LECs to supply their customers with new services, such as video on demand.[9] More generally, Poitras and Vanston argue that "projections for new services

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[3]In his Reply Affidavit, Richard Lee has shown that the LECs have incorrectly used financial reporting lives in deriving their alleged reserve deficiency. He demonstrates that with appropriately calculated asset lives, there is no reserve deficiency. See *Reply Affidavit of Richard Lee*, attached to AT&T Reply Comments, CC Docket No. 96-262 (2/17/97).

[4]John Lube. "Economic Analysis of Depreciation Catch-up Issues." Comments of SWBT, CC Docket 96-262 (1/29/97). Appendix 2, p.1.

[5]Adrian Poitras and Lawrence Vanston. "Implications of Technology Change and Competition on the Local Exchange Carriers." USTA comments, CC Docket No. 96-262 (1/29/97), p. 2.

[6]Lube also defines economic obsolescence to include the decline in an asset's value due to competition (Lube, CC Docket 96-262, p.2.). This error shows a confusion between the effects of technological change and of competition on asset values, which are distinct and separate factors.

[7]The introduction of new technology can also influence an asset's value by extending its economic life, e.g. the application of ADSL broadband technology extending the life of copper distribution plant. See discussion in Krafvtin, Selwyn and Laszlo's "Reply Affidavit attached to AT&T's Reply Comments," CC Docket No. 96-262 (2/14/97), p. 24 ff.

[8]For example, see *Report on Telephone Industry Depreciation, Tax, and Capital/Expense Policy*, Accounting and Audits Division, Federal Communications Commission, April 15, 1987, p. 8.

[9]Lawrence Vanston. *Transforming the Local Exchange Network*. Technology Futures Inc, 1994.

demand show that a ubiquitous broad band digital network will be needed by the LECs in the 2010-2015 time frame".[10] Thus, it appears that the LEC experts link the first and third factors in their minds. But they should not be linked.

What economic justification would there be for LECs to prematurely retire their current plant that is adequate to provide basic local service so that they can offer new, advanced services? Poitras and Vanston claim that "As technology and services have evolved, each generation of customers has paid for the on-going cost of network improvements that have increased quality and decreased prices."[11] In the past, this rationale could have been justified because local phone service was a monopoly and today's and tomorrow's customers were both regulated, and largely even the same customers, so that this was in effect a transfer from today's customers to tomorrow's customers. However, as USTA has pointed out, in the future LEC prices will be set by competition rather than regulation. Hence, today's POTS customers would be paying part of the costs of investment required for new non-basic services in the future. Yet in the future, competitive pressures will force prices to their competitive level, where price equals cost, which includes all capital costs. Thus, they would be transferring wealth not from themselves to other customers in the future, but rather to LEC shareholders.

For purposes of estimating cost-based prices for exchange access, UNEs, and basic telephone services, economic lives should be based on the economic life of telecommunications plant used to provide basic local service. Basing economic lives on the desire by LECs to provide new, advanced services is inappropriate. As will be illustrated below, to do so would be nothing more than a transfer from current ratepayers to LEC shareholders. Moreover, by overstating the true level of depreciation expense, it would artificially raise the price of exchange access and UNEs and lead to higher prices at the retail level. However, contrary to the claims of Poitras and Vanston, MiCRA's earlier study did not argue that LECs should not be allowed into these new services.[12] The point here is merely that the costs of these premature retirements should be assigned to the new services which necessitate those retirements, and not to customers of regulated telecommunications services.[13]

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[10]Adrian Poitras and Lawrence Vanston. "Implications of Technology Change and Competition on the Local Exchange Carriers." USTA comments, CC Docket No. 96-262 (1/29/97), p.ii.

[11]Adrian Poitras and Lawrence Vanston. "Implications of Technology Change and Competition on the Local Exchange Carriers." USTA comments, CC Docket No. 96-262 (1/29/97), p. 14.

[12]Adrian Poitras and Lawrence Vanston. "Implications of Technology Change and Competition on the Local Exchange Carriers." USTA comments, CC Docket No. 96-262 (1/29/97), p. 15.

[13]This argument is especially applicable to SNET's claim that higher depreciation is required due to the replacement of its copper cables with HFC for CATV and broadband to the home. See SNET comments, CC Docket No. 96-296 (1/19/97).

Example of How LEC Premature Retirements Can Create a Spurious "Depreciation Shortfall" Under the LECs Proposed Depreciation Methods

The numerical example below is constructed to illustrate how the LEC approach to depreciation is simply a ruse to get regulators to bless cross-subsidy. Under the LECs' approach to the problem, if they can't force basic ratepayers to subsidize their entry into other services, they label this "problem" a depreciation shortfall.

We consider three alternatives.

(A) is a stand-alone network that provides only POTS service. To avoid contributing to a cross subsidy, POTS consumers should not have to pay more than the total costs over time of this network. This network is assumed to have a useful life of ten years. In particular, we assume that if the firm remains only a seller of POTS, it would regard a regulated prescribed life of ten years as perfectly reasonable. The POTS network is not obsolete for POTS.
(B) is a stand-alone broadband network (for example, a cable system). It also has a useful life of ten years.
(C) is a POTS plus broadband network built by the LEC after the fifth year. This captures the notion that a firm might want to "prematurely" retire a network in order to provide additional service the old network cannot offer. If it is appropriate to build this network, part of the existing network must be "prematurely" retired. The new investment after the fifth year also has a ten year life. It is assumed that the LEC gets all the benefit of any economies of scope.

The example will illustrate that:

i) TELRIC-based depreciation[14] schedules that are subsidy-free will provide the firm with the appropriate signals for whether to choose option C ("prematurely" replacing the POTS network) over option A (not replacing the POTS network and waiting an additional five years to provide broadband services).[15]
ii) These depreciation schedules do not burden basic ratepayers with any of the costs associated with the retiring of the POTS network early. If it makes sense to retire the POTS network early, it can only be because the incremental revenues associated with the new services more than cover the incremental costs.

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[14]Under the FCC's TELRIC principles, TELRIC can be calculated for networks providing only a certain set of services, such as narrowband, or POTS services. This is the same as the stand alone costs of that network. If TELRIC were calculated for adding POTS services to an existing broadband network, the TELRICs would be lower.

[15]It is a feature of the example that so long as broadband service has any incremental value, a broadband network will be built. The only question is when.

iii) Since all the increase in net value due to entry into new services goes to the LEC, the LEC's shareholders keep all the increase in value from selling the new services. To the extent there are economies of scope between POTS and broadband services, this implies that basic ratepayers get none of the benefit from the scope economies. Thus, contrary to the LECs' claims that proper TELRIC depreciation will unfairly or inefficiently harm them in their zeal to become entrepreneurs, in fact the basic ratepayers get none of the gains from trade where LEC entry is warranted and where economies of scope are realized.

In contrast and using the Vanston, et al., methodologies,

i) POTS customers suffer due to LEC entry into broad band services that is profitable under the LECs proposals but unprofitable under the proper TELRIC-based depreciation schedules.
ii) The gain to the LEC from entry is greater than the increase in the net value.
iii) LECs will enter broadband services even if it would not be efficient (i.e., if incremental revenue is less than incremental cost).
iv) POTS customers would be subsidizing LEC entry into broadband services by the amount of the excessive depreciation.
v) A large "depreciation shortfall" appears to be present when entry into broadband services is cross-subsidized.

To keep things simple, I assume all three alternatives have the same variable costs (200/yr) and amount of capital investment (1000), and serve 400 customers (Q=400) with either POTS, broadband (BB) or both together. For a monopoly POTS network, the cost of capital is 10%, for an unregulated broadband services network, the cost of capital is 12%, and for a combined network the cost of capital is the midpoint of 11%. The LECs plan (the "actual" network, in the LECs terminology) is assumed to be to get into the broadband services business in five years. This will require replacing 500 of their 1000 in capital (e.g., copper cable) with new equipment (e.g., fiber) after it has been in service for only 5 years.

	(A) POTS	(B) Broadband services	(C) POTS+Broadband services
quantity/yr.	400	400	400
Capital stock.	1000	1000	1000
variable costs/yr.	200	200	200
capital recovery rate[16]	0.10	0.12	0.10 for the first 5 years 0.11 for the second five years
capital costs/yr.	100	120	100 for first five years 110 for second five years
SL depreciation/yr.	100	100	150 for first five years 100 for second five years
Total Costs/yr.	400	420	450 for first five years 410 for second five years.

The entries are fairly self explanatory, with the exception of the SL (straight-line) depreciation row. The values for columns A and B are simply the ten-year straight-line depreciation values for the $1000 investment. The values in column C, however, reflect the LEC proposals. That is, the LECs have a "real" network plan to replace one-half of the copper network with broadband capability at the end of year 5. As a result, for the initial $1000 copper network, one-half will be retired early. For that $500 of investment, the LECs propose to depreciate at $100 per year since the asset will be removed from service after five years. For the $500 of copper that remains in service over all ten years, the annual depreciation is $50. Annual depreciation in the first five years is thus $150. In the second five years, annual depreciation is $100, reflecting straight-line ten year depreciation of two different $500 investments ($500 of "ten year" copper invested in year 1 and $500 of broad band capable investment at the end of year 5).

The incremental costs of broadband services are thus $50/yr for the first five years (before the LEC even gets into broadband services) due to premature retirements, plus $10/yr for each year after the first five because of higher capital costs due to entry into a competitive market, for a total of $300 over ten years.

Now consider what happens under economic depreciation principles ("TELRIC") versus the LEC proposed rules.

Under TELRIC, the maximum amount that can be collected from consumers of regulated services is $400/yr. If incremental revenues from broadband services in the second five years are equal to the standalone cost of $420/yr, the LEC makes a profit of $1800

[16]These capital recovery rates are chosen for simplicity. They are probably too high. For example, if the cost of capital is 10% and investments are straight-line depreciated over ten years, then (ignoring taxes) total required capital recovery is 16.3% annually. The table shows an annual capital recovery rate of 20%.

(420*5 - 300) over the initial ten years. For each year after the initial ten years, the LEC makes $420 from broadband participation (total revenues are $820 and total costs are $410). This is a bargain for the LEC. On a stand-alone basis broadband services are just a break-even proposition, yet because it captures all the economies of scope, providing broadband services is enormously profitable for the LEC.

If incremental revenues from broadband services are less than $60 per year in years 6 through 10, the LEC cannot afford to enter broadband services in year five, which is as it should be. The incremental profits are negative. Instead, the LEC waits five years until its original POTS-sufficient capital is fully depreciated, and then replaces that capital with broadband services-capable equipment.

In contrast, the LECs claim that since it is known that one-half the copper will be retired short of its useful life, a depreciation shortfall today of $250 has been created. This is the extra $50 annual depreciation in the first five years "necessary to recover" the cost of the copper that will be retired early. If that shortfall is recovered from basic ratepayers over the first five years, then entry into broadband services is privately profitable for the LEC as long as the "losses" do not exceed $190 per year from broadband services in years 6 through 10. In addition, if the LEC is allowed to charge its basic ratepayers a blended higher cost of capital because of its entry into unregulated markets, they will claim the right to recover an additional $10 per year in years 6 to 10. The LECs end up labeling the entire $300 of incremental costs from entering broadband services at the end of year five[17] as either a depreciation shortfall or a competition-induced increase in the cost of capital.

The basic problem with the LEC depreciation proposals is that they do not follow from a reasonable theoretical benchmark. In order to be subsidy-free, broadband services revenues must cover incremental costs. If they do not, then the investment timing (as proposed by the LECs) is inappropriate. But Vanston, et. al., proceed by bootstrap arguments. They assert that it is optimal or necessary that the "actual" network be replaced soon, and then back out the amount of underdepreciation in the system. But assuming the network is not obsolete for the provision of POTS, this in a completely vacuous exercise. In that case, the costs of truncating asset lives to provide new services are part of the incremental cost of the new services.

The second of these three factors, competition, is treated improperly by the LECs. Although LECs will face competition in the downstream market for local exchange services, they are unlikely in the near term to face significant competition in the upstream market for provisions of network elements. Because of significant economies of scale and the high proportion of sunk costs involved in the production of many network elements, local exchange carriers will continue to have significant market (even monopoly) power in the

[17] From the bottom row of the table, one can calculate the total (undiscounted) incremental costs of providing broadband services. It is $50 for the first five years and $10 for the next five years.

provision of these elements. Therefore, it is unclear that competition will significantly affect the economic life of LEC assets, at least for the foreseeable future.

As support for their choice of shorter economic lives in calculating the depreciation shortfall, the LECs propose several benchmarks to validate their estimates. We briefly critique several of these benchmarks. In general, the use of these benchmarks is inappropriate or misleading. Moreover, the LECs are not always very consistent in their treatment of these benchmarks.

The first proposed benchmark is the financial lives reported by the LECs on their financial reports. As Poitras and Vanston have noted, in the last few years most LECs have discontinued FAS 71 accounting for financial reporting purposes.[18] Lube asserts (incorrectly) that the economic lives used by the LECs in computing the depreciation shortfall should be consistent with the lives they use for financial reporting.[19] However, the depreciation lives from financial reports will understate true economic lives because they are governed by the Generally Accepted Accounting Principle (GAAP) of "conservatism." Although GAAP protects the interests of shareholders, it does not protect rateholders from excessive depreciation expense due to understating of asset lives on LEC financial reports.[20] Moreover, whereas it might be appropriate for financial reporting purposes to use asset lives based on premature retirement of plant to provide new, non-POTS services, it would be inappropriate to base asset lives (and hence depreciation rates) for basic local service on those financial lives. Finally, it appears that the consistency claimed by Lube between LEC economic lives for TELRIC purposes and for financial purposes is not always apparent.[21]

The second proposed benchmark is the asset lives of IXCs and CATV operators. It is hardly informative, however, to look at firms that are either in different industries or face quite different competitive conditions. As it was discussed above, in the downstream retail market, there will eventually be substantial competition between IXCs and LECs. In the upstream market for UNEs, nonetheless, the LECs are likely to retain a substantial degree of market power in the near future. As described in detail in the Lee Affidavit, the use of plant by LECs to provide local exchange and exchange access service is much different than the use of plant

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[18]Adrian Poitras and Lawrence Vanston. "Implications of Technology Change and Competition on the Local Exchange Carriers." USTA comments, CC Docket No. 96-262 (1/29/97), p. 6.

[19]John Lube. "Economic Analysis of Depreciation Catch-up Issues." Comments of SWBT, CC Docket 96-262 (1/29/97). Appendix 2, p.4.

[20]This point was also stated by the FCC in Prescription Simplification (1993). Richard Lee also demonstrated in his Reply Affidavit that the LECs have incorrectly used financial reporting lives in deriving their alleged reserve deficiency. He shows that appropriately calculated theoretical reserve studies do not indicate a reserve deficiency. See *Reply Affidavit of Richard Lee*, attached to AT&T Reply Comments, CC Docket No. 96-262 (2/17/97).

[21]For example, in Arkansas SWBT's financial lives were higher than its proposed economic lives for TELRIC purposes by 22% for digital switches and by 23% for digital circuits. See Frederick Warren-Boulton. Rebuttal Testimony on Behalf of AT&T Communications of the Southwest. Arkansas Docket No. 96-395-U, p. 11.

by IXCs and CATV operators.[22]

The third proposed benchmark is replacement cost as proxied by the Hatfield Model.[23] First, it should be pointed out that Rohlfs, et al's, comparison of the gross investment generated by the Hatfield model ($113 billion) with the gross book investment by LECs ($235 billion) is meaningless since much of the LEC plant has already been depreciated. The more appropriate comparison is the net book value of LEC plant (approximately $115 billion), which is quite close to the Hatfield model's estimate. This should not be entirely surprising as for important classes of LEC plant, such as outside plant, the replacement cost has been increasing over time relative to the net plant of embedded facilities. Even this comparison is flawed, however, since the Hatfield Model does not estimate investment needed in order to provide all of the LECs' services included in their existing net book investment. Second, Rohlfs, et al. assertion that the Hatfield model provides "devalued investment" is simply wrong.[24] The Hatfield model does not do this.

Even though the evidence of a depreciation shortfall is not very compelling, the LECs have argued that "Unless the capital-recovery problem is addressed, investors cannot be expected to continue investing on the same terms as the past."[25] This statement is inconsistent with actual investor behavior. For the RBOCs the ratio of their market value to their book value has been increasing from approximately 0.9 in 1984 to about 2.5 in 1996 even after adjusting for SFAS 71 writeoffs.[26] If investors perceived a serious depreciation shortfall, we would not observe market to book values so high. Moreover, because the market to book ratio for the LECs were considerably above 1.0 for most of this 13 year period, it indicates that contrary to LEC claims, the LECs have been consistently earning more than their cost of capital, and there is no evidence that LEC shareholders have been shortchanged by regulators' depreciation practices over this time period.

Alternatively, the LECs have argued that the depreciation shortfall "should not be a shareholder risk."[27] Of course, this ignores the risk to rateholders from premature retirement of LEC assets. If LECs were so concerned about the risk of underdepreciation, why did they accept price caps in the first place? They must have known that under any form of pure price

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[22]See *Reply Affidavit of Richard Lee*, attached to AT&T Reply Comments, CC Docket No. 96-262 (2/17/97).

[23]Jeffery Rohlfs, Charles Jackson, and Ross Richardson. *The Depreciation Shortfall.* USTA Comments, CC Docket No. 96-262 (January 29, 1997), Attachment 15, p. 24.

[24]Jeffery Rohlfs, Charles Jackson, and Ross Richardson. *The Depreciation Shortfall.* USTA Comments, CC Docket No. 96-262 (January 29, 1997), Attachment 15, p. 23-24.

[25]Jeffery Rohlfs, Charles Jackson, and Ross Richardson. *The Depreciation Shortfall.* USTA Comments, CC Docket No. 96-262 (January 29, 1997), Attachment 15, p. 5.

[26]Patricia Kravtin and Lee Selwyn. "Assessing Incumbent LEC Claims to Special Revenue Recovery Mechanisms." CC Docket No. 96-262, Table C2.

[27]John Lube. "Economic Analysis of Depreciation Catch-up Issues." Comments of SWBT, CC Docket 96-262 (1/29/97). Appendix 2, p.3.

caps, depreciation would be endogenous.

And in conclusion, it is ironic that the LECs, who fought so hard for the passage of the Telecommunications Act of 1996, and in which they both won and lost some issues, now want to claim that on the issues they traded away they were unfairly treated. As Kravtin and Selwyn have shown, the Telecommunications Act provided the LECs with a number of new sources of revenues. Moreover, the LECs may expect to make a substantial amount providing services that only they could economically provide because they have been the POTS provider (i.e. they get to keep the economies of scope.) Thus, the LECs are ignoring the tradeoffs inherent in any legislation.

Because embedded costs are sunk by definition, and since even most of the LECs' capital base over the foreseeable future is largely in place and sunk, it should be clear that, in arguing for recovery of past "underdepreciation" or for prices for access elements and UNEs that would reflect "economic depreciation" based on the LECs' own forward-looking plans (as opposed to depreciation that would be anticipated for an efficient POTS-only network), the LECs are making a legal or equity argument, not an economic argument.

I do not comment here on the non-economic merits of their arguments. I conclude that the economic arguments the LECs and USTA have put forth regarding "underdepreciation" are unsound and must be rejected. The policies they propose would allow them to force basic ratepayers to cross-subsidize their efforts to provide services other than basic telephony. They are literally asking the Commission to give them, in the guise of depreciation "reform", a license to steal. TELRIC-based depreciation provides the LECs with the appropriate signals for investing to provide new services, and offers a more than adequate reward for such investments if they are warranted.