Innovation, Investment, and Unbundling: An Empirical Update

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Introduction

In the Winter 2000 issue of the *Yale Journal on Regulation*, Thomas M. Jorde, J. Gregory Sidak, and David J. Teece ("JST") commented on some potential economic consequences of the Telecommunications Act of 1996 as implemented by the Federal Communications Commission ("FCC").[1] The article, published early in the implementation phase of the Act, contained many general assertions about potential consequences, but contained no empirical evidence. JST did, however, offer some interesting and testable propositions. One of these addresses an important issue, verification of which is rather straightforward: JST propose that mandatory unbundling increases the "riskiness and cyclicality of the ILEC's [Incumbent Local Exchange Carrier's] economic performance and, hence, [impacts] on the ILEC's weighted-average cost of capital. Mandatory unbundling raises both components of the weighted-average cost of capital for ILECs—equity and debt."[2] The purpose of this brief Comment is to perform that empirical test and to compare our empirical results with the expectations of JST.

The Impact of Mandatory Unbundling: An Empirical Test

The goal of the Telecommunications Act of 1996 was to "promote competition" and "reduce regulation."[3] As part of this effort, the Act required the ILECs to lease the elements of their networks—unbundled elements—to their rivals at prices commensurate with costs. JST conclude that mandatory unbundling will have adverse affects on the investment of both the incumbent phone companies and prospective entrants. One of the many alleged sources of these investment distortions is the effect of

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    [1]   Thomas M. Jorde, J. Gregory Sidak, & David J. Teece, *Innovation, Investment, and Unbundling*, 17 YALE J. ON REG. 1 (2000).
    [2]   *Id.* at 19. The 1996 Telecommunications Act requires the incumbent local exchange carriers to lease capacity to other telecommunications firms at regulated prices equal to "cost." This capacity—including, but not limited to, loop, switching, and transport facilities—is referred to as an unbundled element. *See* Telecommunications Act of 1996, Pub. L. No. 104-104, 110 Stat. 56 (codified in scattered sections of 47 U.S.C.).
    [3]   *Id.*

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mandatory unbundling on the ILECs' cost of capital. With regard to the cost of equity, the authors indicate "[t]he cost of equity capital depends on the systematic or 'beta' risk of the firm. . . . How does mandatory unbundling affect an ILEC's beta and thus its cost of equity? The answer depends on how unbundling affects the cyclicality of an ILEC's returns."[4] JST assert that mandatory unbundling increases the cyclicality of the ILECs' returns, so beta should increase during an economic downturn. During periods of "weak demand" (i.e., recession), according to JST, Competitive Local Exchange Carriers ("CLECs") find it more difficult to justify facilities deployment. During these periods CLECs are more likely to lease unbundled elements than to construct their own facilities. Weak demand for telecommunications services compounded with an increased demand for unbundled elements, both of which reduce end-user prices and thus profits, and the potential that the elements are priced below costs, all "intensif[y] the cyclicality of an ILEC's returns."[5]

Assessment of the impact of a recession (or any event for that matter) on a firm's beta coefficient is straightforward, and such analysis is frequently employed. A firm's beta is estimated by:

$$R_i = \alpha_i + \beta_i R_m + \varepsilon_i \qquad\qquad (1)$$

where R_i is the stock return on firm i, R_m is the return on a broad market index, α_i is the intercept, β_i is the beta for firm i, and ε_i is the econometric disturbance term. Equation 1 is estimated by ordinary least squares ("OLS"), and typically employs daily, weekly, or monthly returns over periods of various time intervals.

In the present context, it is not the firm beta that is of primary interest, but the difference in beta between a period of economic expansion (β^E) and economic recession (β^R). A statistical test for the non-stationarity of beta across time periods involves a slight modification to Equation 1:

$$R_i = \alpha_i + \beta_i R_m + \gamma_i D + \Delta_i D \cdot R_m + \varepsilon_i \qquad\qquad (2)$$

where D is a dummy variable that equals 1 during the period of economic recession (0 otherwise), γ_i measures the change in the intercept during the recession, and, most importantly, Δ_i measures the change in beta during the recession period.[6] From Equation 2, the expansion and recession betas

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4   Jorde, Sidak & Teece, *supra* note 1, at 19. Beta is the ratio of the covariance between an individual stock's return and the market return to the variance of the market return. RICHARD A. BREALEY & STEWART C. MYERS, PRINCIPLES OF CORPORATE FINANCE 173-78 (2000).

5   Jorde, Sidak & Teece, *supra* note 1, at 20.

6   *See* Phillip R. Daves et al., *Estimating Systematic Risk: The Choice of Return Interval and Estimation Period*, 13 J. FIN. & STRAT. DECISIONS 7 (2000).

can be computed, where $\beta^E = \beta_i$ and $\beta^R = \beta_i + \Delta_i$. The JST hypothesis is that $\Delta_i > 0$, so that the $\beta^R > \beta^E$. The statistical significance of the estimated coefficient Δ_i measures the statistical significance of the null hypothesis that $\beta^R = \beta^E$.

For obvious reasons, JST did not perform this statistical test of their hypothesis regarding the cost of equity capital. As the authors observe, "there has not been a recession since the Telecommunications Act of 1996, [so] the conjecture about increased systematic risk is not falsifiable."[7] At the time of publication, the U.S. was in the midst of one of the longest economic expansions in history. According to the National Bureau of Economic Research, however, this economic expansion ended in March 2001 and the recession has continued until the present.[8] Thus, this empirical test of the JST hypothesis can be performed.

Equation 2 is estimated using weekly stock returns for the three Bell Operating Companies ("BOCs")—BellSouth ("BLS"), Verizon ("VZ"), and Southwestern Bell ("SBC")—and an index of the three companies computed using a simple average of the three stock prices.[9] The market index is measured by the S&P 500. Betas are computed using data for three (224 observations) and five years (328 observations) preceding the recession (March 2001), producing a total of eight regressions.[10]

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7   Jorde, Sidak & Teece, *supra* note 1, at 19.
8   BUS. CYCLE DATING COMM., NAT'L BUREAU OF ECON. RESEARCH, NBER'S BUSINESS-CYCLE DATING PROCEDURE, Feb 12, 2003, *available at* http://www.nber.org/cycles/recessions.html. Choosing the date an "event" actually begins to affect stock prices is perhaps the most difficult component of empirical studies such as this one. It may be that the stock market reflected the expectation of an economic downturn prior to its "official" recognition by economists. Empirical evidence related to stock markets as leading economic indicators is mixed. *See* Douglas K. Pearce, *Stock Prices and the Economy*, FED. RESERVE BANK OF KANSAS CITY ECON. REV., November 1983, at 8-12; Joe Peek & Eric Rosengren, *The Stock Market and Economic Activity*, NEW ENGLAND ECON. REV., May-June 1988, at 40-43. Pearce found evidence to support the proposition that the stock market led economic downturns by two to four quarters. Pearce, *supra*. In alternate regressions, the six months (two quarters) prior to March 2001 were excluded from the sample. The results were essentially the same as those reported in Table 1, with the exception of higher t-statistics (and, thus, higher levels of statistical significance) on Δ for both the "SBC" and "Index" variables. For the 5 year period, Δ is statistically significant at the 5% level or better for "SBC" and "Index," and for the 3 year period Δ is statistically significant at the 5% level (rather than the 10% level) for "SBC."
9   As is well known and documented by Amado Peiro, daily stock returns have both non-normal and asymmetric distributions. Amado Peiro, *Skewness in Individual Stocks at Different Investment Horizons*, 2 QUANTITATIVE FINAN. 139 (2002). These asymmetries and the serious problems they cause (even in large samples) can be virtually eliminated by aggregating to weekly or monthly data. *See id.* at 139 ("While some asymmetries are observed in daily returns, they disappear almost completely in weekly and monthly returns."). Because of the shortness of the time series at hand, weekly aggregation seems most appropriate. For further results on data frequency, see EUGENE F. FAMA, FOUNDATIONS OF FINANCE 38 (1976) ("[The evidence] all lead[s] to the conclusion that distributions of monthly returns are closer to normal than distributions of daily returns"); XUEZHENG BAI, ET AL., BEYOND MERTON'S UTOPIA (I), (Univ. of Chi. Working Paper, 2002) (finding that "large amounts of high frequency data do not necessarily translate into very precise estimates").
10   Based on weekly data, data for the recession period spans March 5, 2001 through June 17, 2002 (the latter being the last reported stock price for the date the data were collected). The three-year betas were computed at the start date March 1998 (March 2, 1998 to June 17, 2002), and the five-

Regression results and the estimated values of β^E and β^R are summarized in Table 1. To improve efficiency of the estimates, the regressions are estimated using generalized least squares.[11]

Table 1. Regression Results

BOC		α_i	β_l	γ_l	Δ_i	R^2	β^E	β^R
BLS	(3 Year)	0.003	0.320	-0.005	-0.052	0.05	0.32	0.27
		(0.85)	(2.65)*	(0.91)	(0.25)			
	(5 Year)	0.003	0.482	-0.005	-0.215	0.08	0.48	0.27
		(1.05)	(4.89)*	(0.97)	(1.11)			
VZ	(3 Year)	0.002	0.547	-0.003	-0.143	0.11	0.55	0.40
		(0.46)	(4.57)*	(0.46)	(0.68)			
	(5 Year)	0.001	0.603	-0.003	-0.198	0.14	0.60	0.40
		(0.58)	(6.56)*	(0.51)	(1.10)			
SBC	(3 Year)	0.002	0.695	-0.006	-0.418	0.11	0.70	0.28
		(0.57)	(4.98)*	(0.89)	(1.71)**			
	(5 Year)	0.002	0.719	-0.006	-0.442	0.14	0.72	0.28
		(0.61)	(6.89)*	(0.98)	(2.16)*			
Index	(3 Year)	0.002	0.520	-0.005	-0.198	0.12	0.52	0.32
		(0.61)	(4.84)*	(-0.84)	(1.05)			
	(5 Year)	0.002	0.598	-0.004	-0.276	0.15	0.60	0.32
		(0.75)	(7.20)*	(-0.93)	(1.70)**			

Note: t-statistics indicated parenthetically
* Statistically significant at the 5% level or better.
** Statistically significant at the 10% level or better.

All the estimated betas (β_i) for the BOCs are less than 1.00 and statistically significant. None of the constant terms (α_i, γ_i) are statistically different from zero. The estimated coefficient Δ_i is of primary interest. For all three BOCs and an index of the companies, the estimated coefficient Δ_i is negative. In no case is a positive value for Δ_i observed. For three of the eight regression models, the null hypothesis of an equal beta during economic expansion and recession is rejected. For SBC (3 and 5 year) and the index (5 year only), the recession beta is less than the expansion beta $(\beta^R < \beta^E)$. In no case is the JST hypothesis that $\beta^R > \beta^E$ accepted, and in three cases it is rejected at the 10% significance level or better for an

year betas were computed with a start data of March 1996 (March 4, 1996 to June 17, 2002). The recession period includes 67 observations (March 5, 1998 to June 17, 2002). Historical data are provided at no charge by http://finance.yahoo.com.

  11   If the econometric disturbance terms do not have constant variance, then the standard errors of the ordinary least squares regression will not be efficient (i.e., the standard errors are too large and, consequently, the t-statistics are too small). Generalized least squares is a technique that improves the efficiency of the estimated coefficients, but does not change the point estimate of the coefficient. See ROBERT S. PINDYCK & DANIEL L. RUBINFELD, ECONOMETRIC MODELS AND ECONOMIC FORECASTS 149-53 (3d ed. 1991). For all regressions, the null hypothesis of homoscedastic errors is rejected using the White Test, see id. at 136.

alternative hypothesis that $\beta^R < \beta^E$. Consistently, it appears that, if anything, the variability of the BOC stocks and, consequently, their cost of equity capital has been lower during the recessionary time period.[12]

Conclusion

Using a standard model for risk measurement, and data for the BOCs that includes periods of both expansion and recession, we find no evidence that the variability and risk of BOC stocks increased during the recession. Indeed, there is some evidence that the opposite might be the case. These results are not consistent with the hypothesis that mandatory unbundling increases the financial vulnerability of ILEC firms and their cost of equity capital.

There are a number of explanations for these findings. While unbundling may affect the profitability of the BOCs, this possibility does not imply a change in the covariance of the BOC stock prices with the market overall. Thus, unbundling may be bad for a BOC's economic performance in some respects without affecting the firm's beta. Further, it may be that the wholesale business for the BOCs, relative to their retail business, is less, not more, cyclical because it shifts retail risks to competitors. Other implications of the 1996 Telecommunications Act, such as the opening of the interLATA long-distance market to the BOCs, also may affect the cyclicality of the BOC stocks. Additionally, if JST are correct that recessions reduce facilities deployment by competitors, then a reduction in risk during a recession may be expected, since BOC profits are higher when a retail customer remains as a wholesale customer without abandoning the network altogether.[13] Finally, because beta is measured at the corporate level, the effects of unbundling on risk are commingled with the effects of other changes, and this commingling may mask the direct effects of unbundling.

In the end, the question of how the provisions of the 1996 Telecommunications Act affect the riskiness and cyclicality of the BOCs' economic performance has no unambiguous theoretical expectation. The issue, therefore, is an empirical question. Empirical questions require

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12   Not all estimating methodologies for the cost of equity capital employ beta. For example, the dividend discount model computes the cost of equity capital as the dividend yield plus the expected growth rate in earnings or dividends, BREALEY & MYERS, *supra* note 5, at 67-68. The cost of capital also consists of return on debt. While under review by the major bond rating firms, only Verizon's debt ratings have not been downgraded (on Dec. 18, 2002), *see* Moody's Investor Serv., *at* http://www.moodys.com.

13   *See* GEORGE S. FORD, A FOX IN THE HEN HOUSE: AN EVALUATION OF BELL COMPANY PROPOSALS TO ELIMINATE THEIR MONOPOLY POSITION IN LOCAL TELECOMMUNICATIONS MARKETS 7 (Phoenix Ctr. Policy Paper No. 15, 2002).

empirical answers, and this paper provides one of no doubt many such answers on this important policy issue.