

# Mandatory Unbundling, UNE-P, and the Cost of Equity: Does TELRIC Pricing Increase Risk for Incumbent Local Exchange Carriers?

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## I. INTRODUCTION

The Telecommunications Act 1996 sought to advance competition in market for local exchange service by promoting facilities-based investment.<sup>1</sup> In implementing the new legislation, the Federal Communications Commission (FCC) stressed the importance of preserving the investment incentives of both the incumbent local exchange carriers (ILECs) and the competitive local exchange carriers (CLECs).<sup>2</sup> However, economic research has explained that forcing an ILEC to share its network with a competitor at total long-run incremental cost (TELRIC) will deter it from investing in its network. Thomas M. Jorde, J. Gregory Sidak, and David J. Teece explained in this *Journal* that mandatory unbundling harms ILEC investment because it increases the ILEC's cost of equity.<sup>3</sup>

In particular, CLECs are more likely to lease unbundled network elements (UNEs) when demand for telecommunications services is weak, because low prices for those services cannot support the high sunk costs of facilities-based investment in the short-term.<sup>4</sup> Alternatively, when demand for telecommunications services is strong, higher prices for those services will afford a CLEC additional revenue to build out its network.<sup>5</sup> Because

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1. See, e.g., Implementation of the Local Competition Provisions of the Telecommunications Act of 1996, Third Report and Order, 15 F.C.C.R. 3696 ¶ 219 (1999) [hereinafter *UNE Remand Order*] (“Goals of the 1996 Act. As noted above, our unbundling analysis takes into account whether unbundling a particular network element is consistent with the goals of the 1996 Act. We find our decision to unbundle [certain local network elements] is consistent with the 1996 Act’s goals of rapid introduction of competition and the promotion of facilities-based entry.”) (emphasis added).

2. *Id.* at ¶14 (“Specifically, unbundling rules that are based on a preference for development of facilities-based competition in the long run will provide incentives for both incumbents and competitors to invest and innovate, and should allow the Commission to reduce regulation once true facilities-based competition develops.”).

3. Thomas M. Jorde, J. Gregory Sidak & David J. Teece, *Innovation, Investment, and Unbundling*, 17 YALE J. ON REG. 1, 19 (2000).

4. *Id.* at 19.

5. *Id.* at 19-20.

TELRIC prices are not compensatory in economic terms, ILEC returns will suffer in times of recession and improve during an expansion.<sup>6</sup>

When the return on an asset becomes more volatile relative to the market, an investor demands a higher premium on that stock because it has made the return on the investor's portfolio less certain.<sup>7</sup> Should an ILEC's systematic risk (commonly known as beta risk) increase in times of recession, its cost of equity would rise. Hence, the ILEC's ability to invest in its network would diminish.

Recent stock market events seem to confirm the Jorde-Sidak-Teece hypothesis. On Monday, January 6, 2003, a front-page story in the *Wall Street Journal* speculated that the FCC would revise its rules on mandatory unbundling at TELRIC prices in a manner that would benefit the ILECs.<sup>8</sup> Specifically, the report implied that CLECs would lose the opportunity to lease all network elements as an "unbundled network element platform," better known as UNE-P. The report was significant because UNE-P had become an entry strategy for CLECs that rested on regulatory arbitrage: UNE-P is functionally equivalent to resale, yet it is more favorably priced for the CLECs than is resale. UNE-P is priced at the sum of the TELRIC estimates of each of the ILEC's network elements required to provide local access service; in contrast, resale is priced by deducting avoided retailing costs from the ILEC's retail rate for local access service. The practical effect of ending the pricing arbitrage created by UNE-P would be to force CLECs to pay resale prices or resort to an entire or partial facilities-based business model for providing local telephony. Put differently, UNE-P would not go away; it would simply be priced by arms-length negotiation between ILECs and CLECs rather than by a regulatory commission. As a result of the dramatic competitive ramifications of this regulatory development, the stock prices of the ILECs and telecommunications equipment manufacturers rose sharply.<sup>9</sup> However, a rigorous statistical test of the Jorde-Sidak-Teece hypothesis is necessary before a conclusion can be drawn on the effect that mandatory unbundling at TELRIC prices exerts on an incumbent's cost of equity.

A formal test of the Jorde-Sidak-Teece hypothesis would estimate the ILECs' beta parameter over the business cycle and determine whether beta had risen, fallen, or remained unchanged during the recession. The

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6. *Id.* at 19. For further discussion of why TELRIC pricing is uncompensatory, see Jerry A. Hausman & J. Gregory Sidak, *A Consumer-Welfare Approach to the Mandatory Unbundling of Telecommunications Networks*, 109 YALE L.J. 417 (1999); Jerry Hausman, *Valuing the Effect of Regulation on New Services in Telecommunications*, 1997 BROOKINGS PAPERS ON ECON. ACTIVITY: MICROECONOMICS 1; J. Gregory Sidak & Daniel F. Spulber, *The Tragedy of the Telecommons: Government Pricing of Unbundled Network Elements Under the Telecommunications Act of 1996*, 97 COLUM. L. REV. 1081 (1997).

7. See, e.g., MARK GRINBLATT & SHERIDAN TITMAN, FINANCIAL MARKETS AND CORPORATE STRATEGY 158 (McGraw-Hill 1st ed. 1998).

8. Yochi J. Dreazen & Shawn Young, *FCC Plans to Erase a Key Rule Aiding Local Phone Competition*, WALL ST. J., Jan. 6, 2003, at A1.

9. The stock prices of BellSouth, Qwest, SBC, and Verizon each rose more than 7.8 percent. The stock prices of Lucent and Nortel rose more than 6 percent. Stock market data are available from *Yahoo Finance* at (<http://finance.yahoo.com/?u>).

National Bureau of Economic Research (NBER) has declared the U.S. economy in a state of recession since March 2001.<sup>10</sup> With stock market data from a recent recession now available, this paper seeks to perform the Jorde-Sidak-Teece test to determine whether mandatory unbundling at TELRIC prices increases the ILECs' cost of equity. Part II reviews the relevant literature on beta estimation and the estimation of structural change in beta parameters. Part IV presents our econometric findings, and Part V compares those results to the empirical research by Robert B. Ekelund and George S. Ford,<sup>11</sup> whose results conflict with the Jorde-Sidak-Teece hypothesis.<sup>12</sup>

## II. THE ESTIMATION OF BETA

An ILEC's beta is the slope coefficient from the time-series regression of the ILEC's stock returns to the return on a market index.<sup>13</sup> One can obtain a single estimate for beta during a given time interval, or one can obtain beta estimates from different time intervals and perform an analysis that statistically compares those two estimates. We discuss these two methods below.

### A. Obtaining a Single Estimate for Beta

Define the returns to stock  $i$  in period  $t$  as

$$(1) \quad R_{i,t} = (P_{i,t} - P_{i,t-1}) / P_{i,t-1},$$

where  $P_{i,t}$  is the closing stock price at time  $t$ , and  $P_{i,t-1}$  is the closing stock price from the prior period. Similarly, define the market returns in time period  $t$  as follows:

$$(2) \quad R_{M,t} = (P_{M,t} - P_{M,t-1}) / P_{M,t-1}.$$

$P_{M,t}$  is the closing market value in period  $t$ , and  $P_{M,t-1}$  is the market value at the close of the prior period. Firm  $i$ 's beta, denoted  $\beta$ , is the slope parameter from the linear regression that estimates equation 3:

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10. NATIONAL BUREAU OF ECONOMIC RESEARCH, THE NBER'S BUSINESS CYCLE DATING PROCEDURE 1 (Jan. 13, 2003). NBER does not adhere to the common definition of a recession as two successive quarters of negative growth. Rather it uses a series of broad economic indicators to understand the overall performance of the U.S. economy. Given those indicators, NBER had yet to determine, as of January 2003, that the economy was again expanding and that a new downturn would constitute a new recession.

11. Robert B. Ekelund & George S. Ford, *Innovation, Investment, and Unbundling: An Empirical Update*, 20 YALE J. ON REG. \_\_\_\_ (2003) (manuscript on file with authors).

12. *Id.* at 5.

13. GRINBLATT & TITMAN, *supra* note 7, at 159.

$$(3) \quad R_{i,t} = \alpha + \beta R_{M,t} + u_t.$$

The parameter  $\alpha$  is the intercept parameter, and  $u_t$  is a disturbance term. The sample includes all observations where  $t$  is within the interval  $\{1, 2, \dots, T\}$ . Using econometric techniques, we seek to find an estimate of  $\beta$ , which we will call  $\hat{\beta}$ .

Obtaining an accurate estimate of beta can be difficult, because that estimate can change as  $T$ , the number of observations in the regression, changes.<sup>14</sup> This finding complicates the estimation in two ways. First, one can obtain systematically lower or higher estimates of beta when one uses weekly, as opposed to daily, stock returns.<sup>15</sup> Second, for a single type of returns data—daily returns, for example—the estimate of beta can systematically increase or decrease as more observations are added.<sup>16</sup> The direction of the bias depends on the number of outstanding shares of the particular firm's stock relative to the number of outstanding share for the average firm in the market index.<sup>17</sup> If firm  $i$ 's volume of outstanding shares exceeds that of the average firm in the market index, then adding more observations to the sample causes  $\hat{\beta}$  to rise.<sup>18</sup> Alternatively, the inclusion of more trading days causes  $\hat{\beta}$  to decrease when firm  $i$  is small relative to the average firm in the market index.<sup>19</sup> Therefore, one must consider the impact that the number of observations has on the regression results when estimating  $\beta$  within fixed time periods.

Monte Carlo studies have found that increasing the number of observations improves the efficiency of the least-squares estimator for  $\beta$ .<sup>20</sup> It is therefore desirable to use daily returns (rather than weekly or monthly returns) to estimate beta. However, increasing the estimation period increases the likelihood that the structure of the firm in question has changed, causing beta to change.<sup>21</sup> If one were to estimate a single beta during a particular time interval when two different beta values existed, the beta estimate would be biased.<sup>22</sup> Consequently, one should not assume that beta has remained stationary over an entire estimation period. Furthermore, it is wise to test for structural change in beta to better gauge the proper time interval to use during the estimation.

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14. See, e.g., Gabriel Hawawini, *Why Beta Shifts as the Return Interval Changes*, 39 FIN. ANALYSIS J. 73, 73-74 (1983).

15. *Id.*

16. *Id.*

17. *Id.* at 75-76.

18. *Id.*

19. *Id.*

20. See, e.g., Philip R. Daves, Michael C. Ehrhardt & Robert A. Kunkel, *Estimating Systematic Risk: The Choice of Return Interval and Estimation Period*, 13 J. OF FIN. STRATEGIC DECISIONS 7, 8, 12 (2000).

21. *Id.* at 8.

22. *Id.* at 8.

### B. Testing for Structural Change in $\beta$

One can use a simple F-test to determine whether beta has structurally changed within a time interval.<sup>23</sup> We seek to determine whether the ILECs' betas are higher during recessions than during expansions. To test for this difference, one would estimate the following:<sup>24</sup>

$$(4) \quad R_{i,t} = \alpha + \alpha_r D_r + \beta R_{M,t} + \beta_r D_r R_{M,t} + e_t,$$

where  $D_r$  is a indicator variable that equals one when the economy is contracting. Applying the least-squares estimator to equation (4), one obtains the regression estimates in equation (5).

$$(5) \quad R_{i,t} = \hat{\alpha} + \hat{\alpha}_r D_r + \hat{\beta} R_{M,t} + \hat{\beta}_r D_r R_{M,t}.$$

During an economic expansion,  $D_r$  equals zero, and therefore the predicted return for firm  $i$  is written as

$$(6) \quad R_{i,t} = \hat{\alpha} + \hat{\beta} R_{M,t}.$$

During a recession, the indicator variable  $D_r$  equals one, and the return equation then becomes

$$(7) \quad R_{i,t} = \hat{\alpha} + \hat{\alpha}_r + (\hat{\beta} + \hat{\beta}_r) R_{M,t}.$$

To determine whether beta is structurally different during the recession period, one could test statistically the null hypothesis that  $\hat{\beta}_r = 0$ . If this hypothesis were rejected, then one would conclude that beta has fundamentally changed during the recession.

## III. ECONOMETRIC RESULTS

We regress daily returns for the four largest ILECs (BellSouth, Qwest, SBC Communications, and Verizon) on daily returns for both the S&P 500 Index and the Dow Jones Industrial Average (DJIA). We use both indexes in our analysis to determine whether our results are consistent. The dataset contains daily returns between January 1996 and December 2002. Table 1 summarizes this dataset.

23. *Id.* at 11.

24. *See id.* at 11. Ekelund and Ford, *supra* note 11, at 2, use this method to test the hypothesis that mandatory unbundling increases the ILECs' costs of equity.

TABLE 1. SUMMARY STATISTICS FOR DAILY PERCENTAGE RETURNS FOR  
THE FOUR LARGEST ILECS, JANUARY 1996-DECEMBER 2002

	Mean	Standard Deviation	Minimum	Maximum
BellSouth	0.040	2.281	-18.105	10.757
Qwest	0.114	5.330	-57.279	54.190
SBC	0.031	2.196	-12.659	11.266
Verizon	0.042	2.126	-11.834	12.271
DJIA	0.036	1.233	-7.183	6.349
S&P 500 Index	0.029	1.269	-6.866	5.733

Note: Data were downloaded from *Yahoo Finance*. Prices for the trading days of August 15, 2002 and September 16, 2002 were not available.

NBER declared that the U.S. economy has been in recession since March 2001.<sup>25</sup> Therefore, an appropriate test of the Jorde-Sidak-Teece hypothesis is to compare  $\beta$  before March 2001 to an estimate of  $\beta$  during the recession. We use two different time periods for the regression. The first period spans trading days between May 1, 1999 and December 31, 2002, so that the sample contains exactly twenty-two months of expansionary data and twenty-two months of recessionary data. The second sample contains returns from trading days between March 1, 1998 and December 31, 2002, such that three years of expansion data are included in this dataset. Table 1 contains regression results from  $\beta$  estimation using daily returns between May 1, 1999 and December 31, 2002. Regression results that used the S&P 500 Index as the market index are presented first, and estimates that used the DJIA as  $R_M$  follow.

25. NATIONAL BUREAU OF ECONOMIC RESEARCH, *supra* note 10, at 1.

TABLE 2. REGRESSION ESTIMATES FOR THE ILEC'S DAILY RETURNS,  
MAY 1, 1999- DECEMBER 31, 2002

Variable	BellSouth		Qwest		SBC		Verizon	
<b>S&amp;P 500 Index</b>	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat
$R_M$	0.45	5.77	1.40	6.98	0.67	8.18	0.62	7.92
$R_M * D_r$	0.46	4.56	-0.01	-0.05	0.18	1.64	0.27	2.59
$D_r$	-0.03	-0.22	-0.17	-0.47	-0.04	-0.29	0.02	0.14
<i>Const.</i>	0.02	0.23	0.07	0.25	0.01	0.11	0.01	0.14
$R^2$	0.20		0.11		0.19		0.21	
<i>Obs</i>	918		916		918		918	
<b>DJIA</b>								
$R_M$	0.59	6.86	1.26	5.62	0.77	8.60	0.63	7.23
$R_M * D_r$	0.29	2.63	-0.01	-0.02	0.05	0.42	0.21	1.95
$D_r$	-0.05	-0.36	-0.20	-0.53	-0.06	-0.40	0.00	0.02
<i>Const.</i>	0.02	0.19	0.05	0.20	0.01	0.06	0.01	0.08
$R^2$	0.19		0.08		0.19		0.19	
<i>Obs</i>	918		916		918		918	

Note: Both the S&P 500 Index and DJIA beta regressions for BellSouth and Qwest show evidence of heteroskedasticity at the 5 percent significance level. When we re-estimated these equations using White-Huber standard errors, we found that the coefficient on  $R_M * D_r$  was still significant in both BellSouth equations at the 5 percent level. The parameter was insignificant in both Qwest regressions.

In Table 2 we find that the estimated coefficients on  $R_M * D_r$  are positive for the BellSouth, SBC, and Verizon regressions. This finding holds regardless of whether one uses the returns on the S&P 500 Index or the returns on the DJIA. Also, the coefficient on  $R_M * D_r$  is statistically significant at the 5 percent level for BellSouth and Verizon.<sup>26</sup>

For the Qwest regressions, the coefficient on  $R_M * D_r$  is insignificant in both statistical and economic respects. In particular, we cannot reject the null hypothesis that  $\hat{\beta}_r = 0$  for Qwest. Also, the estimates of  $\beta_r$  that we obtained for Qwest (-0.01 when using either the S&P 500 Index or the DJIA) are very close to zero. Therefore, we find no evidence that Qwest's beta changed during the recession. Qwest, however, has business operations other than local exchange service provision. For example, Qwest provides long-distance service outside of its local exchange areas.<sup>27</sup> In addition to providing long-distance service, Qwest also owns an Internet backbone network, and provides substantial Internet services as part of its business operations.<sup>28</sup> Therefore, the difference between Qwest's business

26. In the Verizon regression using DJIA returns to proxy for market returns, the coefficient on  $R_M * D_r$  is significant at the 5.2 percent level.

27. See QWEST COMMUNICATIONS INTERNATIONAL INC., 2001 SEC FORM 10-K at 7 (released Apr. 1, 2002).

28. See *id.* at 2, 3-4.

operations and those of BellSouth, SBC, and Verizon during the sample period provides one cogent explanation why the regression results for Qwest deviate from those of the other ILECs.<sup>29</sup>

The  $\beta$  estimates in Table 2 are economically significant. Using S&P 500 Index returns, we estimated that Verizon's  $\beta$  was 0.62 during the expansion period, and 0.89 during the recession. Therefore, a 1 percent increase in the S&P 500 Index had an impact on Verizon's stock returns that was 0.27 percentage points greater during the recession. Put differently, the volatility in Verizon's stock price relative to the S&P 500 Index increased by 44 percent during the recession.<sup>30</sup> Using the DJIA to proxy for the overall market returns, we found that Verizon's  $\beta$  increased from 0.63 during the expansion period to .84 during the recession. Hence, the beta regression that uses the DJIA indicates that Verizon's stock was 33 percent more volatile during the recession.

The increased volatility of the ILECs' stock during the recession increased their costs of equity. Equity cost is found by multiplying a firm's  $\beta$  by the market premium, and then adding the return on a risk-free asset.<sup>31</sup> When  $\beta$  increases, one determines the corresponding increase in equity cost by multiplying the change in  $\beta$  by the market return. Table 3 uses the results in Table 2 to determine the changes in equity cost changes that each ILEC experienced during the recession. To derive these figures, we used a market return of 8.9 percent for the S&P 500 Index and a market return of 8.3 percent for the DJIA, which are the annual returns on those indices since the late 1940s.<sup>32</sup>

29. A comparison of the expansionary betas of Qwest, relative to those of the other ILECs also confirms this fundamental difference. We estimated Qwest's beta during the expansion to be 1.40 using the S&P 500 Index and 1.26 using the DJIA. The expansionary betas for BellSouth, SBC, and Verizon ranged between 0.45 and 0.77. Clearly, Qwest's business operations, on the whole, are fundamentally different from those of BellSouth, SBC, and Verizon.

30.  $(0.27/0.62)*100 = 44$  percent.

31. See, e.g., GRINBLATT & TITMAN, *supra* note 7, at 465.

32. The average yearly return on the S&P 500 Index has been 8.9 percent since 1949. See LEHMAN BROTHERS, HISTORICAL RESULTS OF THE 10 UNCOMMON VALUES PORTFOLIO (downloaded from Lehman Brothers website at <http://www.lehman.com/equities/10uv/history.htm>). The yearly return for the DJIA has been 8.3 percent, on average, since 1945. See DOW JONES AVERAGES, DOW JONES INDEXES (downloaded from Dow Jones Indexes website at <http://www.djindexes.com/jsp/uiHistoricalIndexRep.jsp>).



TABLE 3. THE ESTIMATED CHANGE IN THE ILECS' EQUITY COSTS

	$\beta_{Expansion}$ (A)	$\beta_{Recession}$ (B)	$R_M$ (C) (%)	Risk Premium (%)		Change Equity Cost (%) (E-D)
				Expansion (D=A*C)	Recession (E=B*C)	
<b>S&amp;P 500 Index</b>						
BellSouth	0.45	0.91	8.9	3.98	8.11	4.13
Qwest	1.40	1.39	8.9	12.46	12.35	-0.11
SBC	0.67	0.84	8.9	5.94	7.50	1.57
Verizon	0.62	0.88	8.9	5.49	7.85	2.36
<b>DJIA</b>						
BellSouth	0.59	0.87	8.3	4.87	7.24	2.37
Qwest	1.26	1.25	8.3	10.47	10.41	-0.06
SBC	0.77	0.82	8.3	6.41	6.81	0.39
Verizon	0.63	0.84	8.3	5.22	7.00	1.78

The results in Table 3 indicate that Verizon's equity costs rose by 2.36 percentage points when the S&P 500 Index was used to proxy for  $R_M$  and by 1.78 percentage points when the DJIA was used instead. Similarly, BellSouth's equity costs increased by 4.13 percentage points using the S&P 500 Index and by 2.37 percentage points using the DJIA. Because Verizon's and BellSouth's beta estimates during the recession were statistically different from those during the expansion period, we can conclude that the rise in equity costs for these two firms are statistically significant. Table 3 also indicates that SBC's costs of equity rose by between 0.39 percentage points and 1.57 percentage points. Neither of these estimates is statistically significant at the 5 percent level of confidence, however. Finally, we estimated that Qwest's cost of equity decreased by a negligible amount during the recession. Thus, the cost of equity for three of the four ILECs increased during the recession, and the equity cost increase for two of those firms was statistically significant. Therefore, our statistical analysis supports the Jorde-Sidak-Teece hypothesis.

To determine whether our results in Tables 2 and 3 are robust, we now repeat the analysis using an extended timeframe. Table 4 displays results from the least-squares beta regressions for the four ILECs when the sample is extended to include daily returns between March 1, 1998 and December 31, 2002.

TABLE 4. REGRESSION ESTIMATES FOR THE ILECS' DAILY RETURNS,  
MARCH 1, 1998-DECEMBER 31, 2002

Variable	BellSouth		Qwest		SBC		Verizon	
<b>S&amp;P 500 Index</b>	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat
$R_M$	0.47	7.64	1.60	11.08	0.69	11.08	0.60	10.11
$R_M * D_r$	0.44	4.77	-0.21	-0.97	0.15	1.67	0.28	3.16
$D_r$	-0.07	-0.52	-0.25	-0.81	-0.08	-0.61	0.00	0.00
<i>Const.</i>	0.06	0.75	0.14	0.75	0.05	0.59	0.03	0.44
$R^2$	0.17		0.14		0.19		0.19	
<i>Obs</i>	1213		1209		1213		1213	
<b>DJIA</b>	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat
$R_M$	0.53	7.92	1.50	9.46	0.74	10.90	0.59	8.97
$R_M * D_r$	0.34	3.54	-0.25	-1.09	0.08	0.88	0.26	2.77
$D_r$	-0.09	-0.67	-0.28	-0.91	-0.10	-0.74	-0.02	-0.17
<i>Const.</i>	0.06	0.70	0.14	0.71	0.04	0.54	0.03	0.41
$R^2$	0.16		0.11		0.18		0.17	
<i>Obs</i>	1213		1209		1213		1213	

The results in Table 4 are similar to those in Table 2. A beta regression using the S&P 500 Index indicates that Verizon's beta rose from 0.60 to 0.88, and BellSouth's beta rose from 0.47 to 0.91. Both of these increases are statistically significant at the 5 percent level of confidence. SBC's beta rose from 0.69 to 0.84, an increase that is statistically significant at the 10 percent level of confidence. Using the returns from the DJIA to proxy for  $R_M$ , one finds that Verizon's beta increased significantly from 0.59 to 0.85, and BellSouth's beta increased from 0.53 to 0.87, and those increases are statistically significant. The beta for SBC increased by a small amount, and that increase was not statistically significant. Finally, both the S&P 500 and DJIA beta regressions for Qwest find a statistically insignificant decrease in its beta.

#### IV. COMMENTS ON THE EMPIRICAL FINDINGS BY EKLUND AND FORD

Empirical research by Ekelund and Ford conflicts with our statistical findings. The authors found that the betas for BellSouth, SBC, and Verizon were lower during the recession than during the economic expansion.<sup>33</sup> However, an examination of their estimates reveals that their results could be inaccurate for the following three reasons. First, the authors misconstrue the Jorde-Sidak-Teece hypothesis. Second, Ekelund and Ford used weekly

33. See Ekelund & Ford, *supra* note 11, at 4.

returns rather than daily returns.<sup>34</sup> Third, they did not use a full recession cycle in their estimation. After discussing these three problems with the Ekelund-Ford study, we show why their regression results seem unreasonable given recent stock market events.

A. *Problems with the Ekelund-Ford Study*

Ekelund and Ford incorrectly interpreted the Jorde-Sidak-Teece hypothesis. Jorde, Sidak, and Teece argued that mandatory unbundling of network elements *at prices that are not compensatory* will subject the ILECs to greater risk, and therefore increase their costs of equity.<sup>35</sup> Ekelund-Ford, however, do not mention TELRIC pricing in their explanation of the Jorde-Sidak-Teece hypothesis.<sup>36</sup> From a regulatory standpoint this distinction is vital. If the prices of unbundled network elements (UNEs) fully compensated the ILECs for the real option value of their networks, their risk exposure from mandatory unbundling would be insignificant. Alternatively, the ILECs' risk exposure increases when UNEs are leased at TELRIC prices and with greater intensity—a phenomenon that would occur during a recession.

The empirical analysis in Ekelund-Ford relies on weekly returns data. However, Monte Carlo studies have found that beta estimation using daily returns is superior to an analysis that uses weekly returns.<sup>37</sup> The efficiency gain in econometric estimation from using daily returns results from the larger sample size. Increasing the number of observations in the regression sample decreases the standard errors of the regression estimates, and it thus allows one to take advantage of large-sample properties of the least-squares estimator.<sup>38</sup> Consequently, the regressions in the Ekelund-Ford study could have been estimated with greater precision had the authors used daily returns in their analysis.

The recession period in the Ekelund-Ford study contained weekly returns between March 2001 and June 17, 2002.<sup>39</sup> NBER has yet to declare

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34. In the manuscript that we have on file, Ekelund and Ford claim to use daily returns in their regression. However, their sample sizes is inconsistent with that claim. In particular, the authors state that their regression samples include 224 observations for the time period that spans March 1998 and June 17, 2002 and 328 observations for the sample between March 1996 and June 17, 2002. With over three hundred trading days per year, the authors are clearly using weekly returns in their regressions.

35. See Jorde, Sidak & Teece, *supra* note 3, at 19-20, 36.

36. See Ekelund & Ford, *supra* note 11, at 1, 2, 5 (explaining the Jorde-Sidak-Teece hypothesis).

37. See, e.g., Daves, Ehrhardt & Kunkel, *supra* note 20, at 12.

38. See, e.g., DAMODAR N. GUJARATI, BASIC ECONOMETRICS 781 (McGraw-Hill 3d ed. 1995) (giving an elementary explanation of how the regression estimator improves as the sample size grows); GEORGE G. JUDGE, W. E. GRIFFITHS, R. CARTER HILL, HELMUT LUTKEPOHL & TSOUGH-CHAO LEE, ECONOMETRICS 153-57 (Wiley 2d ed. 1985) (deriving the asymptotic properties of the least-squares estimator).

39. See Ekelund & Ford, *supra* note 11, at 3. In footnote 2, the authors state that the recession period spans from March 2001 to June 17, 2001. We assume that this is a typographical error, and that the authors actually mean June 17, 2002.

that the recession has ended.<sup>40</sup> Consequently, the results in the Ekelund-Ford study do not necessarily contain a full business cycle. A proper analysis of the Jorde-Sidak-Teece hypothesis would be constructed once the full business cycle, or even multiple business cycles, had been declared. Hence, the regressions in the Ekelund-Ford study use a smaller return interval than, and are therefore less efficient than, the regressions that we present here. If the future, a test of the Jorde-Sidak-Teece hypothesis should be produced once NBER has concluded that the current recession has ended.

*B. The Implausibility of the Ekelund-Ford Results in Light of Stock-Market Reactions to the FCC's Possible Elimination of UNE-P*

Recent events in the stock market cast serious doubt on the plausibility of the Ekelund-Ford results. On January 6, 2003, certain telecommunications stocks rallied sharply in response to a front-page story in the *Wall Street Journal* reporting that FCC Chairman Michael Powell would effectively end UNE-P by reducing the number of network elements that the ILECs must offer for lease to competitors on an unbundled basis at TELRIC prices.<sup>41</sup> The economic significance of UNE-P is evident from Table 5, which shows the percentage of CLEC lines over time that rely on UNE-P rather than resale, partial use of facilities-based entry, or total use of facilities-based entry.<sup>42</sup> CLECs have clearly taken advantage of the regulatory arbitrage that UNE-P offers, and have abandoned resale in the process.

TABLE 5. COMPOSITION OF CLEC END-USER SWITCHED ACCESS LINES, DECEMBER 1999-JUNE 2002

Date	Resold (%)	On-Net UNE (%)	UNE-P (%)	Facilities-Based (%)
Dec-99	51.6	11.5	5.6	31.3
Jun-00	40.9	13.6	13.0	32.5
Dec-00	33.9	15.3	17.9	32.9
Jun-01	24.4	17.4	26.3	31.9
Dec-01	20.5	18.8	29.6	31.1
Jun-02	16.4	19.1	35.2	29.3

Source: FEDERAL COMMUNICATIONS COMMISSION, LOCAL COMPETITION REPORT (Dec. 2002).

Even though the rally was tempered when analysts cautioned that state regulatory commissions would fight the FCC to preserve UNE-P,<sup>43</sup> both the

40. NATIONAL BUREAU OF ECONOMIC RESEARCH, *supra* note 10, at 1.

41. Dreazen & Young, *supra* note 8.

42. See FEDERAL COMMUNICATIONS COMMISSION, LOCAL TELEPHONE COMPETITION: STATUS AS OF JUNE 30, 2002 Table 4 (Dec. 9, 2002).

43. Tom Locke, *Analysts Warn Investors to Temper Baby Bell Enthusiasm*, D.J. NEWSWIRE, Jan. 6, 2003.

ILECs' stock prices and the stock prices for the telecommunications equipment manufacturers rose dramatically. A value-weighted index<sup>44</sup> of stock for BellSouth, Qwest, SBC, and Verizon rose 8.4 percent on January 6, 2003.<sup>45</sup> These stock price movements totaled \$18.8 billion. The stocks of the telecommunications equipment manufacturers also improved. A value weighted index consisting of the stocks of JDS Uniphase, Lucent Technology, Nortel Network, and Tellabs increased 8.3 percent on January 6, 2003.<sup>46</sup> Their combined market value increased \$1.5 billion.

We now present a more rigorous, event-study analysis of the market's reaction to the news concerning UNE-P. Focusing on the abnormal returns<sup>47</sup> of the ILECs only would be ambiguous. One can hypothesize that the ILECs experienced positive abnormal returns for either of two reasons: (1) investors expected that the ILECs would avoid losses associated with their compulsory leasing of unbundled network elements at uncompensatory prices under UNE-P, or (2) investors expected that the ILECs would be relieved of the CLECs as serious competitors, since the CLECs had come to rely disproportionately on UNE-P as an entry strategy. The first hypothesis would be consistent with increased sales of telecommunications equipment, whereas the second would be consistent with decreased sales of such equipment (on the rationale that the output of local telecommunications services would decline if the ILECs faced less competition from CLECs, and thus the industry's derived demand for telecommunications equipment would decline). Thus, the abnormal returns of telecommunications equipment manufacturers on and around January 6, 2003 are highly probative of whether mandatory unbundling at TELRIC prices—epitomized in its most extreme form by UNE-P—is thought by the capital markets to increase or decrease investment in the network infrastructure required for local telephony.

To perform our event study, we calculated the abnormal returns for the ILECs and the equipment manufacturers on January 6, 2003. We used both the DJIA and the S&P 500 Index as market indexes in the analysis. Table 6 reports the findings of the event study.

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44. Value-weighting refers to the act of weighting the stock prices in the index by the shares outstanding for each respective company. *See, e.g.,* GRINBLATT & TITMAN, *supra* note 7, at 167.

45. Stock price data were downloaded from *Yahoo Finance* at (<http://finance.yahoo.com/?u>).

46. *Id.*

47. Abnormal returns are the returns of a stock index that cannot be explained by movement in the market index. Put differently, abnormal returns for an index equal the difference between the actual returns on that index and the predicted returns that are derived from an estimated return equation (such as equation (6) above). *See, e.g.,* ZVI BODIE, ALEX KANE & ALAN J. MARCUS, INVESTMENTS 339 (McGraw-Hill 4th ed. 1999).

TABLE 6. ABNORMAL RETURNS OF ILECS AND  
TELECOMMUNICATIONS EQUIPMENT  
MANUFACTURERS ON JANUARY 6, 2003

Index	ILEC		Equipment Manufacturers	
	Abnormal Return	Z Stat	Abnormal Return	Z Stat
DJIA	6.16***	3.14	5.55*	1.28
S&P 500	5.82***	3.05	4.82	1.12

Note: \* indicates statistical significance at 10%, \*\* indicates statistical significance at 5%, \*\*\* indicates statistical significance at 1%.

Table 6 indicates that the abnormal returns for the ILECs and equipment manufacturers on January 6, 2003 were positive and statistically significant. The returns for the ILECs were 6.16 percent higher than normal returns explained by the DJIA and 5.82 percent higher than normal returns as explained by the S&P 500 Index. Those returns were statistically significant at the 1 percent level. Also, the positive returns for the telecommunications equipment manufacturers exceeded by approximately 5 percent the return that the market could explain. Using the DJIA to measure normal returns, the abnormal returns of the telecommunications equipment manufacturers were significant at the 10 percent level of confidence. If mandatory unbundling of network elements at TELRIC prices actually encouraged investment in local telecommunications infrastructure (as the Ekelund-Ford study implies by its finding of lower equity costs for ILECs), then the abnormal returns to the telecommunications equipment manufacturers would have been *negative* on January 6, 2003. Instead, the positive abnormal returns to JDS Uniphase, Lucent, Nortel, and Tellabs reflected an expectation of the capital markets that these firms would have increased net cash flows, which would result from greater (not lesser) sales of telecommunications equipment.

In short, the findings of the Ekelund-Ford study are inconsistent with this positive reaction of the capital markets to news that the FCC might substantially reduce the attractiveness of UNE-P as a business model for CLECs.

## V. CONCLUSION

We have tested the hypothesis that mandatory unbundling would increase the volatility of the ILECs' stock returns during times of recession and therefore increase the ILECs' equity costs. Different time periods and market indexes were used in the analysis to confirm that the results were robust. We find that BellSouth and Verizon experienced statistically significant increases in their equity costs during the recession. BellSouth's costs of equity rose by between 2.37 and 4.13 percentage points, while Verizon's equity cost increased by between 1.78 and 2.36 percentage points. The analysis also indicates that SBC's equity costs rose by as much as 1.59 percentage points, but that this increase was not generally

significant in a statistical sense. These empirical findings support the Jorde-Sidak-Teece hypothesis that mandatory unbundling at TELRIC prices has decreased the ILECs' incentives to invest in their own networks.

We also tested the impact that recent news of the FCC's intent to rewrite UNE-P legislation had on the stock prices of the ILECs and telecommunications equipment manufacturers. Our analysis found that the stock prices of both the ILECs and telecommunications equipment manufacturers responded positively to the prospect that the FCC would eliminate UNE-P as a mandatory offering by ILECs. Furthermore, the stock price increases of both the ILECs and equipment manufacturers were not explained by covariance with the DJIA or the S&P 500 Index. If the findings in the Ekelund-Ford study were correct, then the FCC's elimination of UNE-P as a viable CLEC strategy would deter investment in telecommunications equipment and therefore cause financial markets to devalue the stocks of such companies. The fact that the stocks of equipment manufacturers instead rallied on January 6, 2003 is additional evidence that, as the Jorde-Sidak-Teece hypothesis maintains, mandatory unbundling at TELRIC rates deters the ILECs from investing in the telecommunications network.