Preliminary February 5, 2002

Advanced Workshop in Regulation and Competition

COMPETITIVE CHANGE IN NETWORK INDUSTRIES

21st Annual Eastern Conference

The Newport Marriott
Newport, Rhode Island, May 22–24, 2002

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21st Annual Eastern Conference of the Advanced Workshop in Regulation and Competition

Wednesday, May 22, 2002

2:30 - 3:30 Registration

3:30 - 4:00 Welcome to Conference–Michael A. Crew

4:00 - 6:00 **Paul R. Kleindorfer, Martin F. Grace, Robert W. Klein & Michael R. Murray:** Catastrophe Insurance: Supply, Demand and Regulation

Emilio C. Venezian, C.C. Leng & Michael R. Powers: Did Regulation Change Competitiveness in Property-Liability Insurance? Evidence from Underwriting and Investment Income

Anping Liu: An Analysis of New York State Electric Wholesale Market - Two Years after Deregulation

6:00 - 9:00 **Cocktail Hour, Dinner & Speech:**

Thursday, May 23, 2002

8:45 - 10:30 ***Concurrent Sessions***

WHOLESALE
Chair: William J. Deehan
Discussants: Michael Ambrosio & Colin Loxley

William W. Hogan: Pricing Incentives and Transmission Performance

George Campbell: Capacity Market in the New FERC Mandated RTOs

David E. Hunger: Defining Wholesale Electricity Markets

TELECOMMUNICATIONS
Chair: Saikat Sen
Discussants: David Sapper & Dale Schoenberger

Michael Ward & Yu-Ching Chen: Price Increases from Online Privacy

Julian Wright: Access Pricing under Competition: An Application to Cellular Networks

Timothy J. Tardiff: Pricing Unbundled Network Elements with the Supreme Court Review Looming: Emerging Economic and Modeling Issues

10:30 - 10:45 Coffee Break

10:45 - 12:30 ***Concurrent Sessions***

PRICING
Chair: William T. Flynn
Discussants: Marc Smith

Ahmad Faruqui & Stephen George: Time-of-Use Pricing for Mass Markets: The Next Frontier in Pricing Innovation?

Timothy Mount & Shiyong Yoo: Designing Forward Markets for Electricity to Meet the Needs of Customers

J. Douglas Zona: An Analysis of the Gas Transportation Market: During the California Electricity Crisis

DEFAULT SERVICE
Chair: David Pitcher
Discussants: E. Rand Costich & Steve Sunderhauf

James D Reitzes & Frank C. Graves: Barriers to Deregulation in Retail Electric Power Markets

Menahem Spiegel: Traffic and Network Competition in a Two-Way Communication Network

12:30 - 1:30 Lunch Break

1:30 - 3:15 ***Concurrent Sessions***

PUBLIC BENEFITS
Chair: Ming Mui
Discussants: Larry Spancake & Richard W. Steeves

Richard A. Michelfelder: A Comprehensive Approach to Market Transformation

Sheldon Switzer: Public Benefits Charges to Fund Resource Acquisition Programs: An Orwellian Tale

John Kelly: Cross-Class Subsidies in the Electric Utility Industry: Preliminary Evidence from the Municipal Utility Sector

RISK
Chair:
Discussants: James Cater

Eric T. Ackerman: Risk Measurement Tools For Restructured Electric Utilities

James Alleman: Empirical Estimates of Regulatory Distortions in a Dynamic, Uncertain World

Thomas-Olivier Leautier: Embracing risk to win in the "new" energy world

3:15 Exercise Break

21st Annual Eastern Conference of the Advanced Workshop in Regulation and Competition

Friday, May 24, 2002

8:45 - 10:30	Chair: Discussants: Steve M. Friedlander **Stephane Gallon & Olivier Teissier:** How Much Can Regulatory Reform Bridge the Output Gap **Agustin J. Ros:** The Impact of the Regulatory Process and Price Cap Regulation in Latin American Telecommunications Markets **Karl McDermott & Carl R. Peterson:** What Makes a Successful Performance-Based Regulation Program?
10:40 - 11:00	Coffee Break
11:00- 12:45	Chair: Discussants: Don Laub **John W. Mayo, T. Randolph Beard & David L. Kaserman:** On the Impotence of Imputation **Thomas P. Lyon & John W. Maxwell:** NIMBYism, Corporate Citizenship, and Astroturfing **Nainish Gupta:** Merchant Generation: Strategic Foundation and Implication
12:45 - 12:50	Closing Remarks–Michael A. Crew

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Payment Information: Make checks payable to **"Rutgers University"** and mail to the attention of **Jeremy Guenter** at the above address. Fees include prescribed learning materials, receptions and coffee breaks, but do not include lodging and meals. All persons that do not stay at the Marriott Hotel will be required to pay for meals separately. The government registration fee is available for government employees.

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Catastrophe Insurance: Supply, Demand and Regulation

Martin F. Grace
Georgia State University

Robert W. Klein
Georgia State University

Paul R. Kleindorfer
University of Pennsylvania

Michael R. Murray
Insurance Services Office

Abstract for Eastern Conference

This paper presents the results of the first significant attempt to examine empirically the nature of the supply of and demand for insurance against natural disasters at a detailed, microeconomic level. This examination has been made possible with the unprecedented assembly of an extensive, detailed database on residential insurance transactions affected by catastrophe risk. These data are supplemented by public information on insurer financial and organizational characteristics and the demographics of residential households at a Zip code level.

We explore several significant aspects of residential insurance markets threatened by hurricanes. Our subject is homeowners multiperil insurance that is used to cover residential property. Importantly, our analysis seeks to identify factors that affect the supply of insurance and the determinants of consumer demand using a model that properly reflects their interaction. Our work encompasses key variables and their effects on the quantity, quality and price of insurance purchased. Among the phenomena we seek to illuminate are the sensitivity of demand to prices, household income and other demographic characteristics, policy features and the bundling/unbundling of perils and coverages. Further, we examine insurer and consumer decisions in different market and regulatory environments – Florida and New York – over a four-year period 1995-1998.

Summary of Findings

A number of observations arise from our analysis. Rates in high-risk coastal areas in Florida have risen 100-200 percent, reflecting the reassessment of catastrophe exposure. The availability of coverage has significantly improved since the mid-1990s, but the Florida wind pool still provides coverage for almost 500,000 homes. A number of homeowners insurers left the Florida market and others have entered to take their place. Insurers have adjusted their portfolios, but some carriers retain a high concentration of exposures in southeastern counties. Deductibles, particularly for wind, have substantially increased. New York has also experienced the effects of increased catastrophe risk but to a much lesser degree than Florida.

Our econometric analysis focuses on factors affecting the demand for insurance, examining non-catastrophe and catastrophe coverages separately and combined. We find that the demand for catastrophe coverage is more price-sensitive than the demand for non-catastrophe coverage. This implies that policy measures that reduce insurers' costs of underwriting catastrophe risk could significantly enhance the adequacy of homeowners' insurance protection against disasters.

Further, the demand for non-catastrophe coverage tends to decrease with income. On the other hand, the demand for catastrophe coverage increases with income (but the magnitude of this effect varies substantially between Florida and New York). When both coverages are combined, the negative income elasticity of the demand for non-catastrophe coverage dominates. Overall, the demand for homeowners insurance has a low (negative) income elasticity.

As expected, policy options that expand coverage generally have a positive effect on the demand for insurance and vice versa. Neighborhood and housing characteristics associated with higher risk tend to increase demand. Moreover, in line with theoretical predicitons, as homeowners' equity decreases, their demand for insurance tends to fall. Finally, regulatory suppression and compression of rates induces homeowners to buy more coverage. This may sound desirable to some, but the ultimate effect is to reduce the supply of insurance and reduce homeowners' incentives for hazard mitigation. It may also contribute to uninformed location decisions and to new housing construction that is less disaster resistant than would occur if homeowners faced risk-based insurance prices.

The report proceeds as follows. Section II presents an overview of the residential property insurance markets in Florida and New York and their regulation. Section III outlines our model, the literature supporting it, and the hypotheses that we will test. Section IV describes our methodology and data. Section V presents the results of our analysis and discusses their implications, particularly for regulatory policies. Section VI concludes and discusses some of the policy implications of our findings.

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DID REGULATION CHANGE COMPETITIVENESS IN PROPERTY-LIABILITY INSURANCE? EVIDENCE FROM UNDERWRITING AND INVESTMENT INCOME

By

Emilio Venezian, Chao-Chua Leng, and Michael R. Powers

Abstract

The relationship between underwriting profit and investment income in the U.S. property-liability insurance industry from 1958 to 1999 is studied. Since there was a structural change for both the interest rate and combined ratio in 1981, it is important to check the relationship between theses variables separately for the sub-periods before and after 1981. In the first sub-period, from 1958 to 1981, the relation is not consistent with competitive equilibrium in the financial market. In the second sub-period, from 1983 to 1999, the observed relation is consistent with such an equilibrium. Moreover, the average underwriting profit margin in the first period is significantly higher than in the second period, and is suggestive of monopolistic profits. The change in the relationship between underwriting and investment income shows that competitiveness has changed. The timing of the breakpoint suggests that regulatory action may have affected the competitiveness of the industry.

DID REGULATION CHANGE COMPETITIVENESS IN PROPERTY-LIABILITY INSURANCE? EVIDENCE FROM UNDERWRITINGAND INVESTMENT INCOME

Introduction

A number of papers have developed financial models to predict the relationship between underwriting profit margins in property-liability insurance and interest rates (Venezian (1969), Quirin and Waters (1975), Hammond, Melander and Shilling (1976), Biger and Kahane (1978), Fairley (1979), Hill (1979), Kraus and Ross (1980), Myers and Cohn (1981), and Hill and Modigliani (1981)).

Empirical exploration of the relation must be done with care, since the statistical tool of choice depends on the nature of the series being studied. If the either of the two series being related has a "unit root," then regression can produce misleading conclusions; under those circumstances the tool of choice would be cointegration. On the other hand, if neither series under consideration does indeed have a "unit root," then cointegration can produce misleading results and regression is the tool of choice. This situation is complicated by the fact that it is not possible to be sure that a given series has a unit root; the best we can do is to determine whether statistical tests reject the hypothesis that a unit root is present, and with short time series the statistical results are not very reliable. Series for which the unit root hypothesis is not rejected are often referred to as "nonstationary", meaning that the evidence suggests that they do not have a long-run average and that the average is subject to random changes.

The relation between interest rates and underwriting profit margins has been studied empirically by a number of authors. Haley (1993) used Engle and Granger cointegration to explore the relation between underwriting margins for all lines combined and 90-day Treasury bill rates for the period from 1930 through 1989. He found that these variables are negatively cointegrated, as theory would predict. Haley (1995) explored the relation between the interest rate and the profit margins of seventeen lines of insurance for the period from 1949 to 1992. He found that statistical tests rejected the unit root hypothesis for the profit margins of nine of the lines whereas for the other eight lines and the interest rate, they did not. Applying Johansen cointegration analysis to the relation between the interest rate and the underwriting margin for each of the eight nonstationary lines, he found that only three lines (other liability, auto liability, and group accident and health) have profit margins that are significantly cointegrated with interest rates. Neither of these papers comments on whether the coefficients obtained empirically are consistent with theory.

Grace and Hotchkiss (1995) studied the relation among the combined ratio, short term interest rates, real GDP, and CPI using quarterly data without seasonal adjustments from 1974 to 1990. They used Engle and Granger cointegration analysis and concluded that the series were nonstationary and that the combined ratio was cointegrated with each of the individual explanatory variables and with all of them collectively. The correspondence of the empirical coefficients with financial theory is not discussed.

Perron (1989) and Zivot and Andrews (1992) interpreted many economic series previously thought to be nonstationary as being stationary with one breakpoint, but they found the short-term interest rate is not stationary even with a breakpoint. More recently, however, Malliaropulos (2000) found that in the post-war era, the interest rate series changes both level and slope in 1981, at the time the Federal Reserve Bank changed the methods by which it attempts to control interest rates. Leng (2000) found that the combined ratio of the property-liability insurance industry follows a different data-generating process before and after 1981. She found that the combined ratio follows a strong AR(2) process before 1981 and an AR(1) process after the break. The analysis suggests that both the level and the slope of the combined ratio series also changed at about that time.

The apparent changes in regime for these two series are of concern. Since cointegration tests are valid only for stable nonstationary processes, these findings raise questions about the conclusions reached by studies that ignore the possibility of structural changes. When structural changes are present, the apparent existence of unit roots could arise from these instabilities in the series, and the apparent cointegration could arise from the near-coincidence in time of the changes in regime. Thus the empirical results of the earlier studies may not hold under more careful scrutiny. The primary aim of our research is to examine this issue.

This paper contains several sections. Following the introduction, the financial theory on the relation between underwriting profit and investment income is presented. The data and methodology used are discussed briefly. The empirical results on the relationship between underwriting profit and investment income are then presented. Finally, the empirical results are discussed.

Financial Theory

Some studies, such as Fairley (1979) and Hill and Modigliani (1981), have derived expressions relating the underwriting profits of an insurer to the risk-free rate in a competitive market with capital market equilibrium. Insurance companies have two streams of income: underwriting and investments. Underwriting income arises directly from the insurance operations. Investment income arises from the use of two sources of capital: the insurer's surplus, S, and funds held temporarily by the insurance company because of lags between the receipt of premiums and the payment of losses, 7. Both the underwriting and investment streams are subject to taxation. The tax rate on underwriting income is $J_U\,(t)$, that on investment income is $J_I\,(t)$.

If the insurance investment is in capital asset pricing equilibrium, then, as shown in Appendix I, the expected underwriting margin must satisfy the following:

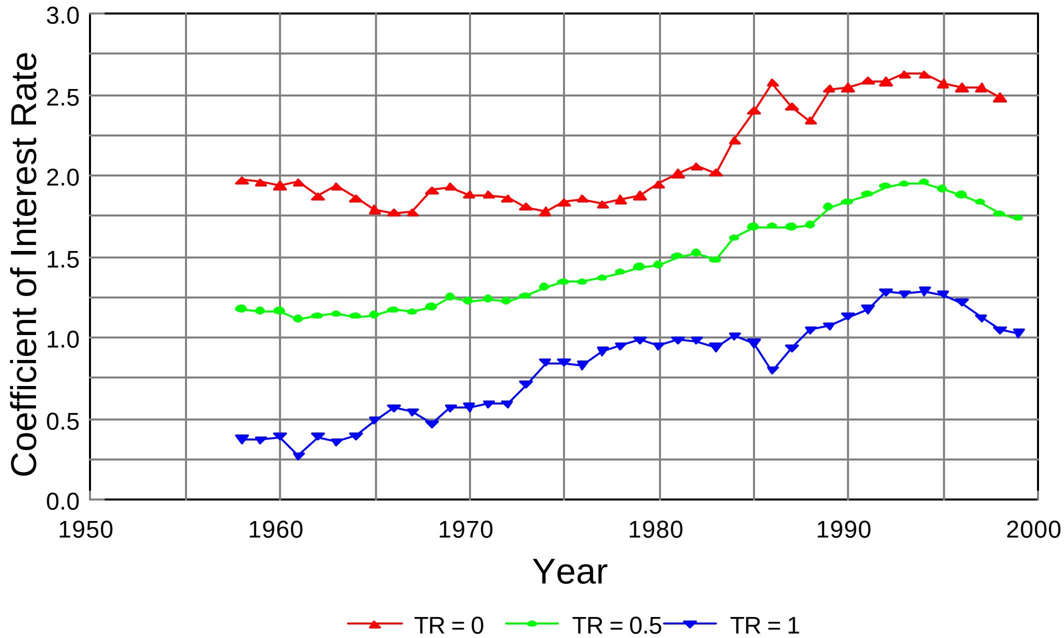
$$E[u^*(t)] = \frac{r^*(t)}{w^*(t)}\left[\frac{t_I^*(t)}{1-t_U^*(t)} - l^*(t)\frac{1-t_I^*(t)}{1-t_U^*(t)}\right] + b_U^*(t)M^*(t), \tag{1}$$

where $r(t)$ is the risk-free interest rate, $M(t)$ is the market risk premium, $w(t)$ is the ratio of premiums to surplus, and $l\,(t)$ is the ratio L/S, the funds generated by insurance per dollar of surplus. The asterisk is used to emphasize that the variables represent the insurance company's estimate of what will hold during the period over which the rates will be in force. It is important to note that the predicted relation between the expected underwriting margin and the anticipated interest rate is not a simple one; it depends on variables that are outside the control of the insurance company, such as tax rates, as well as others over which the insurance company may have some control, such as the premium-to-surplus ratio. This by itself suggests the danger of trying to relate underwriting profit margins directly to interest rates, as previous studies have done.

The factor multiplying the interest rate in Equation (1) may well vary over time. If the ratio of tax rates $TR = J_I\,(t)/J_U\,(t)$ is assumed to be independent of time, this coefficient has be estimated. Figure 1 shows that the coefficient of the risk-free rate does vary substantially over the period for which data are available. This suggests that studies of the relation between underwriting margins and interest rates will contain a serious error in specification.

FIGURE 1

The Coefficient of Interest Rate as a Function of Time when TR (the Ratio of Tax Rate of Investment Income to That of Underwriting Profit) is Independent of Time



Equation (1) relates the equilibrium underwriting profit margin to two quantities. The first is the risk-free rate times a function that depends on the tax rates, the leverage that a company selects, and a measure of the investable funds generated by insurance. This term will be referred to as the investment income variable (*IV*). The second term is related to the systematic risk of the insurance operation, and it will be referred as the risk variable (*RV*). It is worth noting that according to Equation (1) the premium-to-surplus ratio, which is a measure of insurer capacity, is a determinant of underwriting profits, without appealing to capacity constraints as determinants of profit.[1] This suggests that models that include capacity constraints without considering taxes will be severely misspecified.

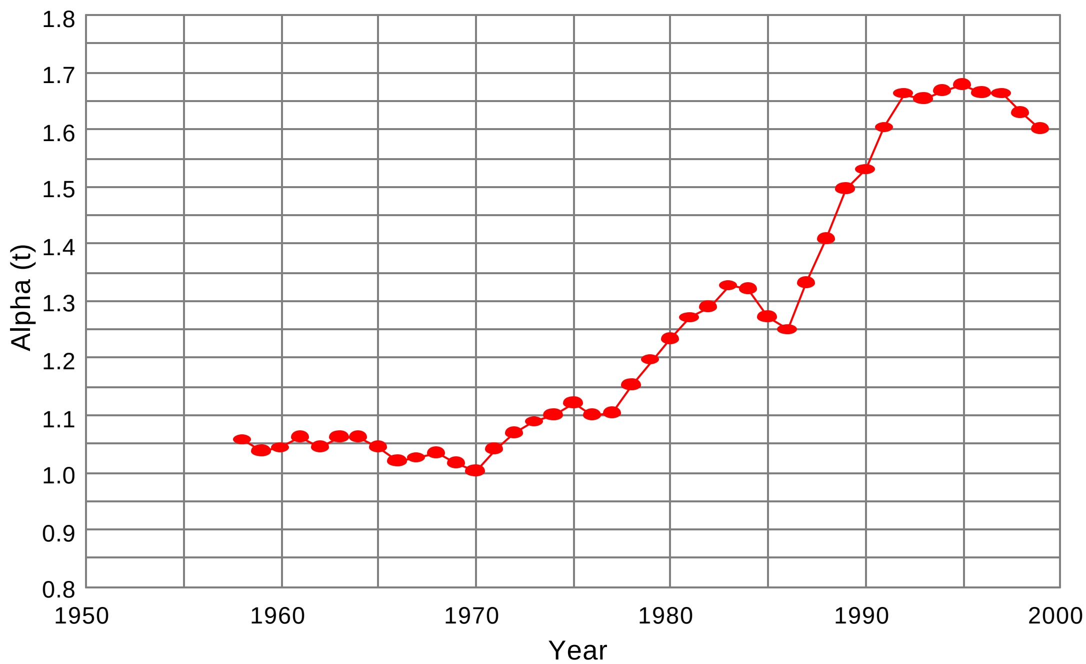
It is worth noting that if taxes are zero, then Equation (1) takes on the simpler form:

$$E[u^*(t)] = -\frac{r^*(t)}{w^*(t)}\, l^*(t) + b_U^*(t)M^*(t) = -r^*(t)a^*(t) + b_U^*(t)M^*(t), \tag{2}$$

where $''^*(t) = 8^*(t)/w^*(t)$. The value of $''(t)$ as a function of time is shown in Figure 2. Since it is not constant over time, any attempt to use regression or cointegration to relate underwriting income to interest rates will be misspecified because multiplicative variables are ignored.

FIGURE 2

The Value of $''(t)$ as a Function of Time



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[1] Gron (1994) and Winter (1988), among others, have presented models with capacity constraints for underwriting profits. When such models are evaluated empirically without using the full financial model, they would be expected to “validate” the hypothesis of capacity constraints simply because capacity variables are important to financial equilibrium even if there in fact are no capacity constraints.

The theoretical relation of Equations (1) and (2) thus has the form:

$$E[u(t)] = -IV_j + b_U M = -IV_j + RV \text{ .}$$

The underwriting profit margin can be specified in a number of ways. In this analysis, it is taken as the underwriting profit margin after policyholder dividends and corrected for catastrophe losses, and will be denoted by the abbreviation *UPMC(t).* The quantity is taken after policyholder dividends because these are largely under the control of management, and the premium levels set by management envision such dividends. The elimination of catastrophe losses is motivated by two concerns: (1) that management cannot set rates for actual catastrophes, but only based on an average level of catastrophe losses; and (2) that this elimination reduces the errors and brings them closer to a statistical model with normally distributed errors.

For the investment income variables (*IV*s), two specifications (*j* = 1, 2) are used. The first, *H(t),* is based on the assumption that management knows, at the time it sets insurance rates, what the relevant values of the variables will be for the following year. The second specification, *H(t-1),* assumes that when rates are set management estimates all variables as those that were valid in the previous year.[2] In estimating the investment variables, Equation (1) with a single tax rate for both underwriting and investment income ($t_I(t) = t_U(t) = t(t)$ *or TR* = 1) is used to calculate *H(t)* as the follows:

[2] A number of other alternatives could be of interest. For example, insurers might have to forecast both the investment income and underwriting profit margin from the information available at the time rates are set. However, modeling the forecasting method is beyond the scope of this paper.

$$H(t) = \frac{r^*(t)}{w^*(t)}\left[\frac{t_I^*(t)}{1-t_U^*(t)} - l^*(t)\frac{1-t_I^*(t)}{1-t_U^*(t)}\right] = \frac{r^*(t)}{w^*(t)}\left[\frac{t^*(t)}{1-t^*(t)} - l^*(t)\right]. \tag{3}$$

These models have fully specified coefficients and take the following form[3]:

$$UPMC + IV_j = b_U M = RV \,. \tag{4}$$

This last equation makes it clear that, whatever the autoregressive structure of the underwriting profit variables and investment income variables, their sum should have the autocorrelation structure the of risk variable, $b_U M$, which is generally considered to be a constant. Hence, that sum should be characterized as stationary noise. If either *UPMC* or *IV* exhibit a unit root and the sum of these variables has a unit root, then the hypothesis of the functional representation should be rejected.

An insurance company's decisions about how rapidly to pay claims and how much to leverage its capital are assumed to be exogenous. It may be more reasonable, however, to assume that these decisions are made after taking into consideration the likely profitability of underwriting operations and the likely level of investment income. They should, therefore, be considered as potentially endogenous variables in future research.

Data

All the insurance accounting data were obtained from *Best's Aggregates and Averages* for various years. Since the basis of reporting has changed substantially over the time period, some

[3] The underwriting profit margin before policyholder dividends, the underwriting margin after policyholder dividends, and the underwriting profit margin before dividends but adjusted for catastrophes, were also tested as underwriting variables. Other investment variables were also tested: the risk-free rate series *R(t)* and *R(t-1)*, *a(t)R(t)*, and *a(t-1)R(t-1)*, and analogs of *H(t)* and *H(t-1)* using surplus based on aggregate rather than consolidated values. The results are very similar to those presented above, but in general *R(t)* and *R(t-1)* did worse than the other investment variables.

insurance variables had to be imputed, and the method of imputation had to be adapted to the available data.[4] Catastrophe data are useful because catastrophes tend to impose an error structure that is far from normal in the error term. Data for catastrophes were obtained from the Insurance Services Office, and were adjusted to a common threshold in constant dollars.

The tax rate is defined as the ratio of taxes paid to taxable income reported by non-financial corporations. The tax rate for insurance companies is not used because insurers derive substantial income from tax-preferred investments, and they shift their portfolios in response to expectations of underwriting results (see Weiss (1985) and Cummins and Grace (1994)). The data on corporate taxes paid by non-financial corporations and their net taxable income were obtained from three sources: *Bureau of Economic Analysis* (1985) provided data for the period 1953 to 1984, *Bureau of Economic Analysis* (1992) provided data for the period 1960 to 1991, and *Business Statistics of the United States* (1999) by Slater and Strawser provided data for the period 1970 to 1998. The data from these sources are overlapping and the data for the overlapped years are not entirely consistent. When there is a single source, the numbers from that source are used. Otherwise, the average of the available sources is used.

The interest rate series used was the interest rate on 30-day Treasury bills, obtained from the FRED database of the Federal Reserve Bank of Saint Louis, which publishes the monthly interest as an annualized rate.

Methodology

The appropriate statistical method for studying the relationship between two time series depends on the properties of the series. Under many conditions the proper statistical tool is regression, a

[4] Details of how to impute values for all variables are available from the authors.

technique which is now generally well understood. It turns out, however, that if the two series under study are both "nonstationary", then regression gives misleading results. Under these circumstances, a technique called "cointegration" becomes the tool of choice. If one of the series is stationary and the other is nonstationary, then there should be no consistent long-term relation between the series.

If the relation under scrutiny is between the series *X(t)* and the series *Y(t)*, then cointegration analysis seeks to find *Z(t)*, a linear combination of the two nonstationary series such that:

$$Z(t) = Y(t) + c \cdot X(t) \qquad (5)$$

is a stationary process.[5] If *X(t)* and *Y(t)* are cointegrated, then there is a long-term equilibrium relation between them. Cointegration also has its drawbacks. If neither of the variables *X(t)* and *Y(t)* has a unit root, then all linear combinations of them will be stationary processes, regardless of the value of *c* chosen in Equation (5).

Unfortunately, the conditions under which regression or cointegration is the appropriate tool refer to the theoretical properties of the series, not to the particular sample of data available for testing. Thus it is never possible to be absolutely certain that the correct tool is being used. In practice, the Augmented Dickey Fuller (or ADF) test is used to determine whether a series has a unit root. The ADF test starts with the hypothesis that the series has a unit root, and uses statistical techniques to determine the extent to which the data reject this hypothesis. When the series under consideration are short, the ADF test may well fail to reject the unit root hypothesis simply because of the limited data available. Thus the failure of the ADF test to reject the unit

[5] Both Engle and Granger cointegration analysis and Johansen cointegration analysis provide estimates of *c*, the cointegrating coefficient, but determining whether the measured value is equal to the theoretical value is difficult. From the financial theory expressed in Equation (3), Equation (5) shows that *X* is *UPMC*, *Y* is *IV*, *Z* is *RV*, and $c = 1$.

root hypothesis is a good reason to be suspicious of regression, but is not a clear indication that the results of cointegration analysis are valid.

There are other reasons for caution in using cointegration. For example, it is well known that the ADF test does not reject the hypothesis of a unit root for the series of interest rates, even if we use monthly data and so have a longer series to analyze. Therefore, studies related to interest rates are often handled by cointegration. On the other hand, some scholars have argued that many economic series exhibit a single break in modern history and that on either side of the break the ADF test *does* reject the unit root hypothesis (see, for example, Perron, (1989) and Zivot and Andrews (1992)). Malliaropulos (2000) found that the interest rate series has a structural break in 1981, a break that he interprets as a possible result of changes in Federal Reserve Bank policy for controlling inflation. If this were true, then cointegration would be an unreliable tool, and regression on the two sides of the break would be preferable.

In the case of the relationship between underwriting profit and investment income, the problem is compounded by the findings of Leng (2000). She found that the underwriting profit margin series for property-liability insurance also exhibits a break in 1981. These findings suggest that the analysis should be performed separately for each of the relevant sub-periods. Since the ADF test involves terms with differences, the second sub-period should extend only from 1983 to 1999 in order to avoid differences between points in different regimes.

Fortunately, a more reliable procedure is available.[6] From Equation (4), theory predicts that if the investment income variable is added to the underwriting profit margin, then the result

[6] Banerjee, Dolado, Galbraith, and Hendry (1993) as well as Hamilton (1994) suggest that if a fully specified theoretical relation exists, then the best way to investigate the cointegrating relation is to use the theoretical model with fully specified coefficients, create the function that theory predicts will be stationary, and test that function for stationarity.

should not have a unit root, regardless of the properties of the two individual series. This result can be used as a direct test of the theory.

Empirical Results

The Period 1958-1999

In view of the apparent changes in regime of the variables involved, analysis of the data for the entire period from 1958 to 1999 may be misleading. The results are presented primarily as background and to provide some connection with previous work. Table 1 shows the results of ADF tests for *UPMC(t)*, the *IV*s, and sums of *UPMC(t)* and the *IV*s. The data for *UPMC(t)* reject the unit root hypothesis at the 5 percent level, but those for *H(t)* do not. The sum of *UPMC(t)* and *H(t)*, and that of *UPMC(t)* and *H(t-1)* both reject the unit root hypothesis at the 1 percent level. The finding that one of the series appears to have a unit root and the other appears not to have one suggests that there is no long-term relation between the variables. The fact that the sum rejects the unit root hypothesis suggests that there is such a relation. Two possible sources of the apparent contradiction will be suggested below.

TABLE 1

ADF Test for *UPMC*, the *IV*s, and the Sums of *UPMC* and the *IV*s for the Period 1958-1999

	ADF[(a)]	p-value [(b)]	Adj. R^2
UPMC(t)	-3.3110**	2.09%	0.2951
H(t), H(t-1)	-2.3371	16.63	0.1223
UPMC(t)+H(t)	-3.9994***	0.34	0.3668
UPMC(t)+H(t-1)	-3.9683***	0.38	0.3087

a. Augmented Dickey-Fuller statistic. The symbols *, **, and *** denote significance at the 10, 5, and 1 percent levels, respectively. MacKinnon critical values are used to adjust for downward bias.

b. Interpolated or extrapolated values. These may not be reliable for probabilities well below 1 percent or well above 10 percent.

The Period 1958-1981

The results of ADF tests for *UPMC(t)*, the *IV*s, and their sums for the first sub-period, 1958 to 1981, are shown in Table 2. In this period *UPMC(t)* is stationary, but *H(t)* is not. The linear combinations of *UPMC(t)* and the *IV*s should have unit roots. In spite of this expectation, both *UPMC(t) + H(t)* and *UPMC(t) + H(t-1)* reject the unit root hypothesis. As for the whole period, the relationship is ambiguous. On the other hand, the sum with the contemporaneous investment variable barely rejects unit root hypothesis at the 10 percent level. One possible explanation for this unexpected result is that, with the number of points in the sub-period, the ADF test lacks the power to reject the unit root hypothesis even if there is no autocorrelation at all in the series. This suggests that failure to reject the hypothesis should not be taken as a certain indication of the existence of a unit root. Another possible explanation is that the randomness in the underwriting profit margin is so large that when the two variables are added together it overwhelms the effect of autocorrelation in the investment income variable.

TABLE 2

ADF Test for *UPMC*, the *IV*s, and the Sums of *UPMC* and the *IV*s for the Period 1958-1981

	ADF[(a)]	p-value[(b)]	Adj. R^2
UPMC(t)	-6.1961***	0.00%	0.6991
H(t), H(t-1)	0.8132	>50.00	0.0371
UPMC(t)+H (t)	-2.6697*	9.50	0.2599
UPMC(t)+H (t-1)	-3.5997**	1.49	0.4309

a. Augmented Dickey-Fuller statistic. The symbols *, **, and *** denote significance at the 10, 5, and 1 percent levels, respectively. MacKinnon critical values are used to adjust for downward bias.
b. Interpolated or extrapolated values. These may not be reliable for probabilities well below 1 percent or well above 10 percent.

The Period 1983-1999

Table 3 shows the results of the second sub-period, 1983-1999. Both *UPMC(t)* and *IV(t)* are nonstationary as measured by the ADF test, but the linear combinations of *UPMC(t)* and both *IV*s are stationary as indicated by the low p-values for the unit root hypothesis. The combination with the lagged investment variable seems to be more relevant than the one with the contemporaneous variable. These results indicate that, for this period, these two variables are cointegrated in the way required by financial theory.

TABLE 3

ADF Test for *UPMC*, the *IV*s, and the Sums of *UPMC* and the *IV*s for the Period 1983-1999

	ADF[(a)]	p-value[(b)]	Adj. R^2
UPMC(t)	-2.2785	19.11%	0.2227
H(t), H(t-1)	-2.5929	11.37	0.2844
UPMC(t)+H (t)	-3.3042**	3.02	0.4968
UPMC(t)+H (t-1)	-4.0864***	0.93	0.4949

a. Augmented Dickey-Fuller statistic. The symbols *, **, and *** denote significance at the 10, 5, and 1 percent levels, respectively. MacKinnon critical values are used to adjust for downward bias.

b. Interpolated or extrapolated values. These may not be reliable for probabilities well below 1 percent or well above 10 percent.

The Evidence of the Means

Financial theory predicts that the sum of underwriting income and investment income should be equal to the risk variable, *RV*, as was seen in Equation (4). This risk variable is the product of the beta of underwriting and the market risk premium, that is, $RV = b_U M$. Although the value of *RV* in any given year cannot be specified objectively with great precision, it is possible to obtain approximate values. The market risk premium is believed to have an expected value of about 6 percent. The beta of underwriting can be obtained by regressing the underwriting profit margin against a market index. For the data set used in this study, estimates of beta are -0.06 for the period from 1958 to1999, -0.01 for the period from 1958 to1981, and +0.08 for the period from 1983 to1999. If these estimates of beta are used along with the estimate of the expected market risk premium, then the values of *RV* are found to be –0.36 percent for the whole period, -0.06 percent for the first sub-period, and 0.48 percent for the second sub-period. Another way of estimating the values of *RV* is from the sum of the underwriting profit margin and the investment income variable. Values calculated this way will be subject to error in any given year, but averaging the annual values over a longer time span will provide information on both the value of *RV* and the errors involved. If financial theory holds, these two different estimates of *RV* should agree. Conversely, if the two sets of values disagree, then the conformance of the results with financial theory is suspect.

The mean value of the sum actually provides additional information as an indicator of the insurers' operating income (which is the combination of underwriting profit and investment income). If the value of the sum is substantially higher than the reasonable range suggested by financial theory, then the implication is that insurers have earned more than a fair rate of return over the relevant period. If, on the other hand, the sum is lower than the reasonable range, then the implication is that insurance rates have been too low to sustain financial equilibrium.

Finally, if the sum is in the appropriate range, then one could reasonably conclude that financial equilibrium has prevailed over the period.

The empirical results for the means of the sums for the three periods of interest *UPMC+IV* are shown in Table 4. The table provides the mean values and the 95 percent confidence intervals associated with the mean. These can be interpreted as the lowest and highest theoretical values of *RV* consistent with the data. If the low end of the confidence interval is above 0.48, then this indicates that underwriting margins have been too high to be consistent with financial theory, and suggests that monopolistic profits were earned. If the high end of the confidence interval is below -0.36, then this indicates that underwriting margins were too low to be consistent with financial equilibrium, and suggests that regulation was confiscatory.

For the entire period 1958 to 1999 and the first sub-period, 1958 to1981, the low-end values of the confidence interval are well above 0.48; this suggests that underwriting profits were larger than what would be predicated by financial theory. On the other hand, the results for the second sub-period, 1983 to 1999, are within the reasonable range, consistent with financial theory.

TABLE 4

The Confidence Range for Sums of the Underwriting Profit Margin and Investment Income

	UPMC(t)+H(t)			UPMC(t)+H(t-1)		
	Low	Mean	High	Low	Mean	High
1958-1999	1.75	3.01	4.26	1.86	2.92	3.98
1958-1981	3.30	4.79	6.28	3.00	4.23	5.46
1983-1999	-1.21	0.60	2.41	-0.68	0.95	2.59

The means of the sums over the two separate sub-periods differ by 4.19 percentage points if H(t) is used as the investment variable and by 3.28 if H(t-1) is used. These differences are significantly different from zero at the 1 percent level, a result is consistent with the hypothesis that there were excess profits for insurers in the earlier period, but that the industry became more competitive in the later period.

Discussion

The results of this analysis point strongly to a shift in underwriting results starting around 1981. At about that time, the relation between underwriting profit margins and investment income also shifted, with strong evidence of cointegration between these variable after 1981 and relatively weak evidence before. The analysis of the mean values of the sums *UMPC(t)+H(t)* and *UMPC(t)+H(t-1)* indicates that the level of profitability also shifted, from one suggesting monopoly profits to one that is quite consistent with competitive equilibrium in financial markets. Hence the shift in underwriting profit margins cannot be explained simply as an adjustment to the shift in the behavior of interest rates.

Leng (2001) reports other shifts suggesting that changes in the insurance industry are not merely adjustments to changes in the financial markets. These changes include the shift from partial to full reflection of investment income in underwriting profits and from cyclical to non-cyclical behavior in the underwriting profit series.

One possible hypothesis is that the observed changes are merely a reflection of events in the insurance market that were beyond the control of either management or insurance regulators. Certainly it was about 1981 that the industry encountered major of liability for asbestos and environmental damage. It is therefore possible that these previously unanticipated losses played a role. These factors, however, are not likely to account quantitatively for the differences observed. The A.M. Best Company (2001) estimates that losses from asbestos and environmental claims amounted to no more than one percent of total premiums earned by property-liability insurers in each of the years from 1997 to 2000, and that these losses have been increasing since the 1980s. Since the losses from these claims were not zero in the period from 1959 to 1981, the change in loss patterns from these causes alone cannot account for more than one-third of the observed difference in the means shown in Table 4. Other factors must have been had a role.

Regulatory concern with the reflection of investment income in insurance premiums is not new. The modern concern with this issue is often traced to the Remand Decision of the Supreme Court of New Jersey to the Department of Insurance to hold hearings on this subject. The subject surfaced again in Massachusetts in 1975, where Fisher Black presented a financial model later extended by Fairley (1979), Hill (1979), and Hill and Modigliani (1980). The academic community was introduced to these issues by Kahane (1978) and by Biger and Kahane (1978). By the late 1970s, both New Jersey and Massachusetts had ratemaking methods that took investment income into account explicitly. These methods spread to other states in highly regulated lines of business.

Before 1980, the NAIC, along with several state regulators, began to question the role of ratemaking bureaus in the market. Moreover, some states had changed to open competition, thus creating a potential threat to insurance practices under federal anti-trust laws. By the 1980s, the NAIC was seeking to limit the role of the Insurance Services Office (ISO) in ratemaking. Concurrently, the Attorneys General of a number of states filed suit against ISO for what they viewed as anti-competitive practices. ISO fought these perceived intrusions into its traditional roles, but progressively changed from promulgating rates to providing forecasts of loss costs. The overall result of these efforts may well have affected ratemaking.

Apart from the regulatory framework, interest rates reached very high levels in the late 1970s and early 1980s. Commercial policyholders reacted to the higher interest rates by switching progressively toward self-insurance. This movement may have changed the competitive climate and insurers who tried to avoid "cash-flow underwriting" may have lost market share. It is then quite plausible that around 1981, when interest rates peaked, insurers had been forced through regulation and the effect of competitive forces to reflect in full the effect of investment income when making insurance rates.

This view of events suggests future research. If indeed the industry became more competitive around 1981, it is probable that some lines became competitive earlier than others. Commercial lines, which usually compete with self-insurance, might well have been the first to feel the effect. Also, automobile insurance, which was the line first impacted by regulatory pressure for the inclusion of investment income in ratemaking, might have been affected earlier than other lines of business. Thus, further analyses of data by line of business are likely to be useful. A major difficulty for researchers addressing this problem is the appropriate allocation of investment income net of taxes to the individual lines.

References

A.M. Best Company, 2001. *Asbestos Claims Surge Set to Dampen Earnings for Commercial Insurers*, Special Report, May 7, 2001, Oldwick, NJ.

Banerjee, Anindya, Juan Dolado, John W. Galbraith, and David F. Hendry, 1993. *Co-integration, Error-correction, and the Econometric Analysis of Non-stationary Data*, Oxford University Press, Oxford, UK.

Biger, Nahum and Yehuda Kahane, 1978. "Risk Considerations in Insurance Ratemaking", *Journal of Risk and Insurance*, vol. 45, no. 2, pp. 121-132.

Bureau of Economic Analysis, U.S. Department of Commerce, 1985, *Business Statistics 1984* (24th Edition), U.S. Government Printing Office, Washington, DC.

Bureau of Economic Analysis, U.S. Department of Commerce, 1992, *Business Statistics 1963-91* (27th Edition), U.S. Government Printing Office, Washington, DC.

Charemza, Wojciech W. and Derek F. Deadman, 1997. *New Directions in Econometric Practice*, second edition, Edward Elgar, Cheltenham, UK.

Cummins, J David and Grace, Elizabeth, 1994 "Tax Management and Investment Strategies of Property-Liability Insurers", *Journal of Banking and Finance*. vol. 18, no. 1, p 43-72.

Fairley, William B., 1979. "Investment Income and Profit Margins in Property-Liability Insurance: Theory and Empirical Results", *Bell Journal of Economics*, vol. 10, pp. 192-210.

Fields, Joseph A., and Emilio C. Venezian, 1989. "Interest Rates and Profit Cycles: A Disaggregated Approach", *Journal of Risk and Insurance*, vol. 51, pp. 312-319.

Grace, Martin F. and Julie L. Hotchkiss, 1995. "External Impacts on the Property/Liability Insurance Cycle", *Journal of Risk and Insurance*, vol. 62, pp. 738-754.

Gron, Anne, 1994. "Capacity Constraints and Cycles in Property-Liability Insurance Markets", *RAND Journal of Economics*, vol. 25, pp. 110-127.

Haley, Joseph D., 1993. "A Cointegration Analysis of the Relationship Between Underwriting Margins and Interest Rate: 1930-1989", *Journal of Risk and Insurance*, vol. 60, pp. 480-493.

Haley, Joseph D., 1995. "A By-Line Cointegration Analysis of Underwriting Margins and Interest Rates in the Property-Liability Insurance Industry", *Journal of Risk and Insurance*, vol. 62, pp. 755-763.

Hamilton, James D., 1994. *Time Series Analysis*, Princeton University Press, Princeton, NJ.

Hammond, J. D., E. R. Melander, and N. Shilling, 1976. "Risk, Return, and the Capital Market: The Insurer Case", *Journal of Financial and Quantitative Analysis* , vol.11, pp.115-131.

Hill, Raymond D., 1979. "Profit Regulation in Property-Liability Insurance", *Bell Journal of Economics*, vol. 10, pp. 172-191.

Hill, Raymond D. and Franco Modigliani, 1981. manuscript presented at the 1982 Massachusetts automobile hearings, reprinted in *Fair Rate of Return in Property-Liability Insurance*, J. David Cummins and Scott A. Harrington (editors), Kluwer-Nijhoff, Boston, 1986.

Kahane, Yehuda, 1978. "Generation of Investable Funds and the Portfolio Behavior of Non-Life Insurers", *Journal of Risk and Insurance*, vol. 45, no. 2, pp. 65-78.

Kraus, Alan and Stephen A. Ross, 1980. *The Determination of Fair Profits for the Property-Liability Insurance Firm*, MRR Inc.

Kraus, Alan and Stephen A. Ross, 1982. "The Determination of Fair Profits for the Property-Liability Insurance Firm", *Journal of Finance*, vol. 37, pp.1015-1028.

Leng, Chao-chun, 2000. "Underwriting Cycles: Stationarity and Stability", presented at the Annual Meeting of the American Risk and Insurance Association, Baltimore, MD.

Leng, Chao-chun, 2001. *An Examination of the Fluctuations in Underwriting Profits of Property-Liability Insurers*, Ph.D. Dissertation, Temple University, Philadelphia, PA.

Malliaropulos, Dimitrios, 2000. "A Note on Nonstationarity, Structural Breaks, and the Fisher Effect", *Journal of Banking and Finance*, vol. 24, pp. 695-707.

Myers, Stewart C. and Richard A. Cohn, 1981. "A Discounted Cash Flow Approach to Property-Liability Insurance Rate Regulation", manuscript presented at the 1982 Massachusetts automobile hearings, reprinted in *Fair Rate of Return in Property-Liability Insurance*, J. David Cummins and Scott A. Harrington (editors), Kluwer-Nijhoff, Boston, 1986.

Perron, Pierre., 1989. "The Great Crash, the Oil Shock and the Unit Root Hypothesis", *Econometrica*, vol. 57, pp. 1361-1401.

Quirin, David G. and William R. Waters, 1975. "Market Efficiency and the Cost of Capital: The Strange Case of Fire and Casualty Companies", *Journal of Finance*, vol. 30, pp. 427-450.

Slater, Courtenay M. and Cornelia J. Strawser, editors, 1999. *Business Statistics of the United States*, (5th Edition), Bernan Press, Lanham, MD.

Venezian, Emilio, 1969. “The Effects of Changing Capital Levels on Insurance Stockholder’s Return and Risk”, in *Studies on the Profitability, Industrial Structure, Finance, and Solvency of the Property-liability Insurance Industry*, Arthur D. Little, Inc., Cambridge, MA.

Venezian, Emilio, 1982. "Risk, Return, and Rate Regulation in Property-liability Insurance", *Journal of Insurance Regulation*, vol. 2, pp. 98-124.

Venezian, Emilio, 2001. “Empirical Analyses on the ‘Underwriting Cycle’-- A Critical Comment”, presented at the Annual Meeting of the American Risk and Insurance Association, Indianapolis, IN.

Weiss, Mary, 1985. “Multivariate Analysts of Loss Reserving Estimate in Property-Liability Insurers”, *Journal of Risk and Insurance*, vol. 52, pp.199-221.

Winter, Ralph A., 1988. “The Liability Crisis and the Dynamics of Competitive Insurance Markets”, *Yale Journal of Regulation*, vol. 5, pp. 455-499.

Zivot, Eric and Donald W. K. Andrews, 1992. “Further Evidence on the Great Crash, the Oil Price Shock, and the Unit Root Hypothesis”, *Journal of Business and Economic Statistics*, pp. 251-270.

APPENDIX 1

If the insurance company places its investable funds in a portfolio of systematic risk $\$_P$, then the total income I(t) to the insurer will be:

$$I(t) = [S(t) + \Lambda(t)] \cdot [r(t) + b_P(t) M(t) + e(t)](1 - t_I(t)) + W(t) u(t)(1 - t_u(t)),$$

where r(t) is the risk-free rate, M(t) is the market risk premium, W(t) is the level of premiums earned by the insurer, u(t) is the underwriting profit margin, and $e(t)$ is the residual error.

Factoring by S, this can be expressed as:

$$I(t) = S(t)\left(\left[1 + l(t)\right] \cdot \left[r(t) + b_P(t) M(t) + e(t)\right] \cdot \left[1 - t_I(t)\right] + w(t) u(t) \left[1 - t_u(t)\right]\right),$$

where 8 = 7/S and w = W/S.

The expected total income of the insurance company is:

$$E[I(t)] = \left(\left[1 + l^*(t)\right] \cdot \left[r^*(t) + b_P^*(t) M^*(t)\right] \cdot \left[1 - t_t^*(t)\right] + w^*(t) E[u(t)] \cdot \left[1 - t_U^*(t)\right]\right),$$

where the asterisk is used to emphasize that these quantities are those known at the time that prices for time *t* are set, not necessarily those that exist at time *t*.

The appropriate discount rate for the value of the insurer's investment income is *r(t) + M·Cov[R, $R_{M]}$/Var[R_M],* where *R* is *I/S* and R_M is the return on the market. Financial theory sets the present value of the insurance company as the ratio of the expected total income to the insurer I(t), divided by the discount rate. If the insurance investment is in the capital asset pricing equilibrium, then this value, *V(t),* must be equal to the funds, *S(t).*

$$S(t) = \frac{S(t)\left\{\left[1 + l^*(t)\right] \cdot \left[r^*(t) + b_P^*(t) M^*(t)\right]\left(1 - t_I^*\right) + w^*(t) E[u(t)] \cdot \left[1 - t_U^*(t)\right]\right\}}{r^*(t) + \left[1 + l^*(t)\right] \cdot \left(1 - t_I^*\right) \cdot b_P^*(t) \cdot M^*(t) + w(t) \cdot \left[1 - t_U^*(t)\right] \cdot b_u^*(t) \cdot M^*(t)}$$

Solving this equation for *E[u(t)]* we find that the systematic risk of the portfolio disappears and we obtain Equation (1). The fact that the systematic risk of the portfolio disappears means that this relation is valid for all values of that risk.

An Analysis of New York State Electric Wholesale Market – Two Years after Deregulation

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Abstract

The New York State electric utilities have been deregulated and a wholesale market has been running under the New York Independent System Operator for two years. Is the market workably competitive? How has it evolved? What are the lessons learned from the evolvement? This paper attempts to dress some of these issues and analyze the competitiveness of the market and various market monitoring effort and the impacts on the wholesale electric price variations.

The competitiveness will be examined from several perspectives. First, a statistical summary is presented to give a crude indicator for the competitiveness of the market. Second, the market concentration is measured with conventional methods, with consideration of market definition such as the dynamics of transmission conditions and imports. Third, a regression analysis is performed on price variations, in an attempt to detect the existence of market power exercises and the effectiveness of market monitoring efforts. Fourth, the raw bids are analyzed to assess the competitiveness of the market. Finally, discussions are devoted to market evolvement and whether the introduction of price responsive load bidding and virtual bidding have improved the market competition.

Conclusions will be drawn from these analyses, along with the lessons learned from the market design and monitoring procedure for the deregulated electric industry.

Pricing Incentives and Transmission Performance

Abstract of Proposed Paper for May CRRI Conference

William W. Hogan

12/22/01

Transmission companies provide the physical infrastructure that supports electricity markets. Greater reliance on markets could be extended to the problem of providing better incentives to make efficient decisions about network maintenance and upgrades. A challenge is to define performance standards that relate to the needs of the market while targeting actions under the control of transmission companies. Financial transmission rights (FTRs) define long-term property rights in congestion rentals that substitute for physical rights. The same FTRs could be a basic tool for providing incentives for transmission companies. This paper will explore further this idea and the practical implementation to deal with complexities such as joint cost allocation and liability limits.

Capacity Market in the New FERC Mandated RTOs

Abstract for 21st Annual Eastern Conference

George H. Campbell III

This paper will explore the structures of potential capacity markets in new FERC-ordered RTOs. It will concentrate in areas of the country that presently do not have operating FERC-approved RTOs. The paper will identify capacity market structures that will complement the FERC mandated real time and day ahead energy markets. It will also explore how capacity markets will replace long-term reliability adequacy reserve sharing agreements that electric utilities presently have.

In present FERC-approved RTO energy markets, there are price caps. Price caps prevent "blowout hours" for energy and thus, future generation will not be able to recover its fully embedded costs. If energy markets are going to have price caps, which most people agree will be a political reality, capacity markets allow generation owners to recover their fixed costs. The paper identifies different market structures that will allow for fixed cost recovery of new generation.

Capacity markets will also replace regional reliability reserve sharing agreements. The paper will also explore how these markets should be set up to maintain historical reliability that the areas have experienced in the past. It will also identify how regions should tailor capacity markets for local characteristics.

The paper will also explore the reason for tension in capacity markets between load serving entities (local electric utilities and retail access providers) and physical generation owners.

Defining Wholesale Electricity Markets

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This paper examines the issue of defining the relevant wholesale electricity markets. It also chronicles the recent efforts of the Federal Energy Regulatory Commission (FERC) to define the relevant market in order to assess the level of competition in wholesale electricity markets. The physical realities of the electric transmission network present unique problems in defining the relevant geographic market. Due to changing transmission constraints, the geographic scope of the market can vary from hour to hour. In addition, the product itself is difficult to define: energy, capacity and ancillary services are separate products that can be supplied by the same facility.

Ex post analyses of market competitiveness largely rely on price-cost margins and compare the observed market price to the competitive benchmark. In order to estimate the opportunity cost of producing electricity from a given generator, all alternative markets in which the generator can participate need to be known.

Ex ante analyses of market efficiency focus on market structure, also requiring a precise market definition. The FTC/DOJ Merger Guidelines provides a framework for defining relevant geographic and product markets that can be applied to electricity markets. FERC has defined the relevant geographic market as all those suppliers who are one wheel

[1]The opinions and conclusions of the author do not necessarily reflect those of the Federal Energy Regulatory Commission or any of its Commissioners.

away from a given destination market in its market analysis for determining whether to grant market-based pricing authority. In its analysis of the effect of mergers or generation dispositions on competition, FERC uses the Delivered Price Test, which starts with a large set of potential suppliers and allows transmission availability to determine the geographic scope of the market.

Price Increases from Online Privacy

Abstract for 21st Annual Eastern Conference

Michael Ward and Yu-Ching Chen
University of Illinois

Consumers value keeping some information about them private from potential marketers. E-commerce dramatically increases the potential for marketers to accumulate otherwise private information about potential customers. Online marketers claim that this information enables them to better market their products. Policy makers are currently drafting rules to regulate the way in which these marketers can collect, store, and share this information. However, there is little evidence yet either of consumers' valuation of their privacy or of the benefits they might reap through better target marketing. We provide a framework for measuring a portion of the benefits from allowing marketers to make better use of consumer information. Target marketing is likely to reduce consumer search costs, improve consumer product selection decisions, and lower the marketing costs of goods sold. Our model allows us to estimate the value to consumers of only the latter, price reductions from more efficient marketing.

Access Pricing under Competition: An Application to Cellular Networks

Abstract for 21st Annual Eastern Conference

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A new class of access pricing problems is analyzed, in which upstream firms compete for customers and access to these customers is required by downstream markets. Using fixed-to-cellular calls as an example, a model is presented which shows the effects of fixed-to-cellular termination charges on competition and market penetration in the cellular sector. The model shows that the determination of cellular termination charges is quite different to standard access pricing problems. An escalation of termination charges arises when cellular firms cannot coordinate their charges. Even with coordination, cellular competition does not generally drive termination charges to cost. Despite this, above-cost termination charges can be efficient, since they promote more aggressive cellular pricing and higher cellular penetration rates.

Policy implications are given, as are implications for other network settings such as the origination and termination of long-distance calls on competing local networks, termination of ISP-bound calls, the termination of international calls by long-distance operators, and the setting of interchange fees in payment systems. The results of the paper are also used to discuss the use of the principle of charging subscribers for receiving calls and the policy of bill-and-keep.

PRICING UNBUNDLED NETWORK ELEMENTS WITH THE SUPREME COURT REVIEW LOOMING: EMERGING ECONOMIC AND MODELING ISSUES

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Abstract

In July 2000, the 8th Circuit Court of Appeals overturned the Federal Communications Commission's rules for pricing the unbundled network elements that incumbent local exchange carriers (ILECs) must provide to new entrants. In early 2001, the Supreme Court chose to review that ruling. Despite the uncertainty over the ultimate fate of the FCC's total element long-run incremental cost (TELRIC) pricing rules, several regulatory commissions—including the FCC itself in a Virginia proceeding—have continued to examine prices under the challenged rules.

These proceedings have challenged all parties with the fundamental questions of what costs and prices would look like under competitive conditions and how close the TELRIC rules allow one to approximate such competitive outcomes. This paper discusses the issues that have emerged for these challenges. In particular, alternative answers to the following questions are identified.

- What types of firms would enter in competitive network industries
- What effect would new entry have on the asset values and prices of incumbent firms
- In modeling such firms, what impact would competition have on (1) the types and vintages of capital equipment, (2) prices for that equipment, and (3) conditions in the operating environment, including efficient levels of spare capacity, opportunity for sharing resources with other firms, and depreciation and cost-of-capital.

The paper concludes by highlighting alternative pricing proposals offered by contending parties and identifying the major drivers that explain what have proven to be large differences among competing proposals, e.g., the difference in standard loop prices in Virginia of $6.50 proposed by competitors versus the $22 proposal by the ILEC.

Time-of-Use Pricing for Mass Markets:
The Next Frontier in Pricing Innovation?

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Price volatility in wholesale power markets during the past three years has increased interest in developing pricing strategies designed to encourage peak shifting and load reduction, thereby reducing wholesale price volatility and average energy costs. Many new pricing strategies that have emerged in the past several years have focused on large commercial and industrial customers. With the notable exception of Puget Sound Energy's time-of-use (TOU) pricing program directed at residential customers, there has been little progress toward incorporating price-induced demand response among mass-market consumers.

Regulators are increasingly concerned about the limited focus on mass-market consumers, denying a large and important market segment the benefits of product innovation. Forward-looking utility executives are also realizing that their companies may be overlooking a major source of value creation.

Many utilities have offered TOU pricing to consumers on a voluntary basis dating back to the early eighties. However, for a variety of reasons, few consumers currently receive electricity service based on prices that vary by time of use. First, traditional TOU rate designs feature very long on-peak price periods that make it difficult for consumers to shift load to lower-cost periods. Second, TOU rates have rarely been marketed to the same extent that other demand-side management programs have been. Third, advanced metering costs, especially when meters are deployed on a piecemeal basis, significantly extend the payback period associated with TOU rates for consumers. Finally, utilities and regulators share the concern that residential consumers will not really change their usage patterns in response to time-varying rates or, if they do, it will lead to revenue erosion among participating consumers, which would have to be made up by raising rates to all consumers.

Increasing interest in economically efficient pricing combined with recent technology developments and reductions in metering costs suggest that TOU pricing economics should be revisited. In addition, a number of utilities have implemented large-scale installations of wireless, fixed network, automated meter reading systems to improve the economics of meter reading and outage detection. These systems can typically be adapted to implement TOU pricing at comparatively low cost.

This paper discusses a new generation of TOU pricing designs that offer considerable promise in terms of generating potentially large net benefits for participants, utility and society. These new strategies incorporate selective "dispatchability" in that prices are raised to more closely match costs for critical peak periods or extreme days, the timing of which is not known by consumers or the utility until shortly before they occur. For example, one design uses a four-part pricing strategy in which prices for all four periods are known ahead of time, but the timing of the fourth "critical" period is not known until the day before. Another design uses day-of-year pricing in which prices are much higher for all 24-hours during a small number of days (e.g., 10 critical days) and are slightly lower than the baseline price during all other days. These designs resemble in some ways the Tempo rate design, which was implemented in France by EdF in the mid-nineties.

These designs represent an approximation to real time pricing for residential consumers, and hold considerable promise. The paper quantifies the benefits and costs of these programs for a prototypical utility. It presents numerical simulations for two hypothetical utility systems, one that already has a fixed, wireless system in place and one that does not. Net benefits are estimated from a variety of perspectives, including those of participating consumers, non-participating consumers, the utility, and society at large. Both voluntary and mandatory implementation scenarios are examined.

Results from the new-generation pricing designs are compared with those from traditional TOU rate structures. A number of sensitivity tests are run to determine how results vary with changes in key driving variables such as the price elasticity of demand by pricing period and marginal energy and capacity costs by pricing period.

Designing Forward Markets for Electricity to Meet the Needs of Customers

Timothy D. Mount and Shiyong Yoo
Cornell University

Since electricity is effectively non-storable (from an economic perspective) and varying patterns of congestion occur on the grid supplying electrical energy to load centers, the design of forward markets for electrical energy is more complicated than the design of forward markets for fuels like natural gas and oil. It is not practical to have a central market like Henry Hub for electricity. For customers buying electricity in a spot market, spot prices can vary by an order of magnitude over the space of a few hours, and at the same time, price spikes can be spatially localized in a small region such as an urban center.

Currently, forward markets for electricity are conducted primarily over-the-counter through bilateral contracts. Public information about these markets is limited, and the volumes traded in standard commodity markets, like the New York Mercantile Exchange, are very small. Most of the institutional developments to support forward contracting have been designed to allow suppliers in low cost regions to secure access to congested regions with high prices. The two alternative ways to do this are 1) through a physical allocation of transmission capacity (flowgates) or 2) a financial hedge (financial transmission rights). There are strong advocates for both approaches, and typically, the approach adopted in a region is chosen by a Regional Transmission Operator (RTO) and incorporated into the market rules for operating the spot market and dispatching generators to meet load. The design of forward contracts has generally not been a major concern of an RTO. Nevertheless, the form of forward contracts can have an important effect on how efficiently a market works.

The objective of this paper is to look at the problem of forward contracts from the perspective of buyers, and to identify the characteristics that an efficient forward market in a given region should have. More specifically, the paper builds on earlier research showing how weather derivatives can be used to hedge against the price risk and volume risk of purchasing relatively large amounts of electricity on hot days when price spikes are likely to occur. Forward contracts are specified for 1) a fixed purchase of energy at a relatively low price, and 2) an uncertain purchase of peaking energy at a relatively high price on hot days when the load is higher than normal. The advantages of this type of contract are that 1) the relation between high load and high price is strengthened, 2) the incentives to conserve energy on hot days are also strengthened, and 3) the effectiveness of weather derivatives as a hedge against price and volume risk is increased. These concepts will be applied to data from the three northeastern markets in the USA. In addition, the implications of price-responsive load (interruptible contracts) as a way to mitigate price spikes will be investigated for a standard fixed price contract versus the proposed two-part contract combined with a weather derivative.

An Analysis of the Gas Transportation Market
During the California Electricity Crisis

by

J. Douglas Zona
Cornerstone Research

Between May of 2000 and May of 2001 California experienced high wholesale electricity prices, frequent transmission grid emergencies, and on several occasions power curtailments. While conditions in California's electricity markets have been attributed to a variety of causes, conditions in the California natural gas and gas transportation markets have received less attention. The price of natural gas delivered in California rose dramatically during this time, from an average of $3.59 per MMBtu in May 2000 to a high of $55.38 per MMBtu in early December 2000. While gas prices rose throughout the country, California prices greatly exceeded national levels. This study attempts to examine the role of natural gas transportation market in setting the price of gas in California and its consequent impact on electricity prices.

Barriers to Deregulation in Retail Electric Power Markets

by

James D. Reitzes and Frank C. Graves
The Brattle Group

Abstract:

Our paper focuses on the regulatory strategies used to induce consumers to change to unregulated retail power providers, looking at the experiences so far in Pennsylvania, New Jersey, Maryland, and other states. The initial section of the paper will present evidence and provide an explanation for the limited market penetration by third-party retail providers to date. In many cases, the explanation for the limited success of these retail providers has little to do with high energy costs at the wholesale level (as arose in California), but instead relates to the regulatory structure at the retail level.

We find that "provider-of-last-resort" (POLR) obligations and other default-service obligations imposed on incumbent utilities by regulators are among the main culprits for the lack of retail market development. These obligations typically are structured in a manner that inhibits consumer movement to third-party retail providers. Regulators frequently force these obligations to be offered at below-market prices, and allow consumers to switch to (away from) fixed-price, default-service providers whenever energy costs rise (fall). As a result, retail customers use fixed-price POLR service and other regulated default service obligations as a free option. However, to encourage retail competition, these options should be fairly priced.

After this discussion, we then build a theoretical model that determines a “fair” price for POLR obligations and other default-service obligations, consistent with the economic value of the service being offered. This section concludes with simulation results that look at the market value of default-service obligations, relative to their actual prices, in particular cases.

In the last section, we offer going-forward suggestions regarding transitional regulation in moving toward retail competition. This will include recommendations for restructuring, eliminating, or outsourcing POLR obligations, as well as the use of shopping credits to acquaint consumers with other retailers and overcome experience-based brand preferences for incumbents.

A Comprehensive Approach to Market Transformation

By

Richard A. Michelfelder
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This paper and presentation will discuss a comprehensive approach to energy efficiency market transformation . This paper offers a unique, integrated framework for assessing market environments, program potential, and program and market effects, that would lead to a comprehensive market transformation program market assessment, design, and evaluation.

The approach features a flexible template that links current and potential market actors and market barriers to the adoption of the targeted technology; to market interventions that are (or should be) targeted to overcome those barriers; and to current or potential market effects indicators. Each of these elements is presented in the context of a dynamic adoption process model. The process begins with the establishment of the market baseline, including elements such as the current market size, the technical and economic potential for relevant energy efficiency applications, and position of each market actor in the adoption process (including, very importantly, current energy efficiency actions). A vision of a mature, self-sustaining marketplace is then presented, and the actions that must occur to move from the current market baseline to the mature marketplace are specified. Constructing this integrated story of how a market is likely to develop provides the comprehensive framework needed to design, implement, assess, and refine the most effective market transformation programs possible.

An example of a residential new construction home market will be discussed within this theoretical framework.

<u>Abstract</u>

Public Benefits Charges to Fund Resource Acquisition Programs: An Orwellian Tale

By Sheldon Switzer
Director, Electric Pricing and Tariffs
Baltimore Gas and Electric Company

The language of truth is simple.
-- Euripides

And the simple truth is that a public benefits charge on electric and gas utility ratepayers to fund resource acquisition programs is a tax to fund expensive and inefficient rebate programs in the name of "conservation and energy efficiency." So why call a tax on utility ratepayers a "public benefits charge?" It is after all, a **tax**! And why call a rebate program to promote certain technologies a "resource acquisition program?" It is after all a **rebate program**, involving cross-subsidies to participants from the general body of ratepayers. Euripides knew the answer.

And now for a simple truth: One can be strongly pro-conservation, recognize the need for market intervention of some form, but still oppose the creation of bureaucratic organizations spending large sums of monies to benefit the few at the expense of the many, and not necessarily with desirable income redistribution effects.

"Orthodoxy means not thinking ... not needing to think. Orthodoxy is unconsciousness."
-- George Orwell, *<u>1984</u>*

Advocates for taxing utility customers to fund conservation rebate programs often cite many reasons for doing so. Under the broad category of market failure are considerations such as imperfect information, split incentives, lack of access to capital, short planning horizons and externalities (environmental and energy security). There is certainly a degree of validity to each of these concerns. However, market failure does not mean that one should intervene in the market with a central planning approach that creates inefficiencies and imposes large cross-subsidies between ratepayers.

This paper will review the history of Demand-Side Management programs in Maryland and discuss existing regulations and laws. Two recent documents will be reviewed and critiqued: (1) the Maryland Public Service Commission's Report on Energy Efficiency and Conservation Programs (Demand-Side Management) to the Maryland State General Assembly, February 2001; and (2) the Report of the Governor's Task Force on Energy Conservation and Efficiency, December 2001.

The policy perspective presented will be that there should not be another hidden tax on utility ratepayers to fund the activities of a State agency for the promotion of energy efficiency and conservation. The funding of a State agency to achieve broad public policy objectives should be accomplished through General State Funds. And any money expended should be on programs that are cost effective and spent in a manner that works in conjunction with competitive market

incentives. For ultimately, it is the business or residential consumer that will capture the benefits of energy conservation on their energy bills.

Center for Research in Regulated Industries: Call for Paper: Advanced Workshop in Regulation and Competition

21st Annual Conference, May 22-24, 2002, Newport, Rhode Island.

Abstract Submission:

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Paper Title: **Cross-Class Subsidies in the Electric Utility Industry: Preliminary Evidence from the Municipal Utility Sector**

One piece of conventional wisdom in the electrical utility industry is that the rates of residential customers are subsidized by industrial customers. Evidence, however, of this alleged fact that is based on proper assumptions and analyses appears difficult to find. The studies that are offered to support this view of who is subsidizing whom seem, typically, to be based on the fully allocated costing procedures used in utility industry ratemaking. The inherent inadequacy of fully allocated cost methodologies in determining economic costs of good or services is well documented and accepted by most economists. Consequently, any estimates of cross-class subsidies based on such studies are highly suspect, at best, and are an inadequate basis for utility operating decisions or for public policy decisions.

The proposed paper has four parts. The first will provide a brief review of the evidence that is typically relied on to support the claim that residential customers are being subsidized by industrial customers. The second part will briefly review the economic view of what should and what should not properly be considered to be a cross-class subsidy. The third part, the major one, will attempt to estimate the degree of cross-class subsidies using data on numerous municipally owned electric utilities. Municipal utilities provide a very good data set because: they are numerous, the business part of their operations is relatively uncomplicated, and there are also numerous contrasting cases (i.e., differing compositions of retail loads). The final section will offer some tentative conclusions.

Abstract:[1]

Risk Measurement Tools For Restructured Electric Utilities

Eric Ackerman, Edison Electric Institute

Two fundamental lessons of restructuring are, first, that vertical disintegration (unbundling) creates new risks, for customers, for suppliers; and certainly, for regulated utilities; and second, that accurate measurement and management of risk is key to success in restructured markets. Clearly, one of the distinguishing characteristics of market leaders in the supply segment is that they have well developed risk modeling capabilities, which they use to design and price products.

For regulated utilities, the implication is that they - and to some extent, regulators - also need to learn how to use new tools to measure and manage risk. Traditional methods (e.g., beta analysis) don't adequately capture the risks inherent in unbundled operations. New tools are needed to identify key risk drivers, and to design and price risk-differentiated service options. To preserve access to capital, wires companies need to offer investors risk-adjusted returns, and need to demonstrate adaptive business strategies based on accurate measurement of risk.

The proposed paper will provide an update on the development of new risk measurement tools by regulated wires companies (i.e., investor-owned electricity transmission and distribution companies). It will describe risk-measurement methodologies that are being identified for consideration by EEI members. Included will be traditional cost of capital methods, updated to account for changes in market structures; and methods from capital markets, adapted to model the risk structures faced by wires companies. The discussion also will address how risk measurements can be used to design risk-differentiated service options.

[1] Note that this abstract is premised on research being planned for early 2002. To the extent this research does not materialize, the abstract would have to be adjusted.

Empirical Estimates of Regulatory Distortions in a Dynamic, Uncertain World

James Alleman
University of Colorado, Boulder, CO & Columbia University, New York, NY, USA
14 December 2001

Abstract

This paper shows that the introduction of uncertainty can make a significant difference in the valuation of a project. This manifests itself, *inter alia*, in the manner in which modelling the regulatory constraints can affect the value of the investment. In particular, the inability to exercise the delay, abandon, start/stop, and time-to-build options has an economic and social cost.

This paper uses real options analysis to address issues of regulation that have not been adequately quantified. We show that regulatory constraints on cash flow have an impact on investment valuations in the telecommunications industry. A model is developed to empirical estimate the cost of regulation for payphones and broadband services. We show that the cash flow constraints, inability to delay and abandon has a significant cost. Because some costs are not recognized in a static world, a failure to recognize the operation and implications of real options theory by regulators will lead to a reduction in welfare.

Embracing risk to win in the “new” energy world

EXECUTIVE SUMMARY

Restructuring of the electric power and natural gas industries is transforming the way energy executives think about risks: in the old regulated days, risk was passed on to ratepayers through carefully negotiated regulatory agreements. Many utilities have attempted to follow this approach in the last few years, and most have failed. Fortunately, best practices are available, from either other comparable industries such as banking and insurance, or from leading players in the energy space. This article presents a four-step framework to embrace risks: risk quantification, tactical risk management, asset portfolio restructuring, and financial portfolio restructuring. The article describes each step of the process, and provides numerical examples of how each step could enhance shareholders’ value creation.

HOW MUCH CAN REGULATORY REFORM HELP
TO BRIDGE THE OUTPUT GAP ?

Stéphane Gallon & Olivier Teissier(Ministry of Economy and Finance, France)

Abstract

The difference between potential and real economic growth (called "output gap") often stems from market inefficiencies. By introducing more competition, the regulatory reform of network industries aims at reducing these inefficiencies and should therefore increase the actual growth of the Gross Domestic Product.

This paper assesses the output gap's reduction that is expected from regulatory reform in the European energy industry (electricity and gas). First, it focuses on micro-economic issues : restructuring of supply and demand, change in companies' stock value, and change in energy prices. A new equilibrium is found and compared with pre-reform situation. Then, a macro-economic model assesses the effects induced on GDP by the regulatory reform. This model takes into account European consumption, investment, and public expenditure.

The regulatory reform is found to lead to a 0.5 to 1.0 point rise of GDP (depending on the hypotheses) and a fall in structural unemployment by 0.3 to 0.6 point (to compare with an average level of 8% in EU). As a matter of fact, if regulatory reform proves globally efficient to accelerate growth, some undesirable effects alter this acceleration, in particular transition costs. For instance, since most of European energy industries used to be state-owned monopolies, an inappropriate timing in liberalisation / privatisation may reduce public revenues without providing sufficient macro-economic compensation.

The theoretic results found here are based on the (unrealistic) assumption that the regulatory reform leads to a perfectly competitive energy market. The actual effects would therefore be less important than assessed here. Anyhow the model proves that, in Europe, electricity's regulatory reform leads to much more macro-economic benefits than gas' regulatory reform. This is consistent with Europe's choice to open to competition first its electricity market (and second its gas market). The model also shows that timing in regulatory reform plays a prominent influence on its macro-economic impact.

Keywords : energy, deregulation, GDP, output gap, economic growth

The Impact of the Regulatory Process and Price Cap Regulation in Latin American Telecommunications Markets

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The transfer of state-owned telecommunications assets to the private sector has been the linchpin of telecommunications reform in many developing economies during the 1990s, (Noll 2000). Coupled with a more liberalized and competitive telecommunications market structure, privatization has generated significant economic benefits in developing and developed economies, (Bortolotti et. al. 2001, Megginson 2001; Ros 2000, 1999). Some of these benefits include: increased network expansion, reduced waiting time for network access, increased capital investment and improved operating efficiency. The benefits to the overall economy from a more developed and efficient telecommunications sector are considerable, (Röller and Waverman 2001; Saunders, Warford and Wellenius 1994).

While policymakers actively pursued privatization and liberalization in many countries, an area that has received less attention by policymakers is the setting up of truly independent regulatory agencies. Only recently have countries embarked down this path. With the exception of a few studies discussed below, our understanding of the impact that regulation has on telecommunications markets in developing economies is minimal.[1] The significance of the regulatory process on sector performance is likely to be large. In fact, a recent study Wallsten (2001) indicates that not only is an independent regulatory associated with improved sector performance but, unlike previous studies, privatization is beneficial only when coupled with an independent regulator. The purpose of this paper is to investigate the impact that the regulatory

[1] See, Wallsten (2001), Bortolleti (2001) and Gutierrez and Berg (2000) for some of the first econometric analyses on this topic.

process has had on telecommunications development in Latin America. Specifically, in addition to controlling for privatization and liberalization, I analyze the impact that an "independent" regulator has on the performance of the sector much in the same manner as Wallsten (2001), Bortolotti *et. al.* (2001) and Guiterrez and Berg (1999). In addition, I go beyond these studies and examine the impact that a certain type of regulation, price cap regulation, has on sector performance in Latin America.

WHAT MAKES A SUCCESSFUL PERFORMANCE-BASED REGULATION PROGRAM?

Karl A. McDermott
Carl R. Peterson

Abstract

In an earlier paper we tested the proposition that performance-based regulation provided utilities with the incentive to become more efficient than operating under traditional regulation. This proposition was tested utilizing data envelopment analysis (DEA) employing cross sectional data for 1999. The preliminary results were not inconsistent with the hypothesis that PBR promotes higher levels of efficiency. However, other factors such as electric industry restructuring were found to have significant effects as well. This paper proposes to test a similar hypothesis utilizing an expanded data set that includes (1994 and 2000) and nearly all US electric utilities. In addition our PBR data set has been expanded to include a more comprehensive set of parameters that characterize the various state PBR plans. In addition to utilizing DEA to identify the performance in each of the two years the analysis will include an examination of the change in performance between 1994 and 2000 utilizing simple regression analysis. The results will allow the authors to make conclusions concerning the efficacy of utilizing different PBR plan designs, as well as comparative analysis of regulation over time. The paper will conclude with a critique of the DEA analysis and its applicability to evaluating alternative regulation processes.

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On the Impotence of Imputation

By

T. Randolph Beard   David L. Kaserman and John W. Mayo

Abstract

A regulatory policy known as imputation has been recommended and applied in situations where a regulated firm with monopoly power over an essential input faces the threat of entry in one or more of its downstream markets. This policy generally imposes a price floor on the regulated firm's downstream output equal to the price it charges for the input plus the incremental cost of transforming a unit of that input into a unit of the final output. Such a floor is intended to prevent the regulated company from implementing predatory and/or preemptive pricing strategies against its downstream rivals.

In this paper, we demonstrate the need for an imputation-type policy to safeguard downstream entrants from exclusionary pricing strategies by the vertically integrated incumbent. At the same time, however, we also illustrate several strategies available to the vertically integrated firm that can render imputation ineffective against such exclusionary conduct. We conclude, therefore, that imputation is unlikely to (effectively) protect new entrants that attempt to compete at the downstream stage.

NIMBYism, Corporate Citizenship, and Astroturfing

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ABSTRACT

In recent years, attempts to site hazardous waste facilities, electric generating units, and other manufacturing plants have increasingly met with the response: "Not In My Back Yard." (NIMBY) Controversies over "environmental justice" have heightened tensions around facility siting decisions. Some authors condemn NIMBYism for making it costly or even impossible to site socially valuable but locally noxious facilities. Others see NIMBYism as a countervailing power that can help prevent corporate malfeasance.

We present a formal model of the licensing process for new facilities, and study alternative corporate strategies that might be used to reduce community resistance. We build on Lohmann's (1993) pioneering work on mass protests as instruments of information aggregation. She shows that when individuals possess private information about the likely effects of a policy, their political actions may serve as informative signals to policymakers. This information may shift the likelihood of political decisions that serve the interests of politically active citizens, thereby making political action worthwhile. In Lohmann's analysis, the policymaker knows the distribution of left-wing, right-wing and moderate citizens in the population. She also knows that extremists are likely to take political action regardless of the true merits of the proposed policy. Hence, she discounts the number of protesters to account for the expected "manipulative" action of extremists.

If citizen action serves only to improve the information of a decision-maker, it cannot lead to the welfare-reducing obstruction of which NIMBYism is accused.[1] We therefore extend Lohmann's model and assume that the costs incurred by a firm proposing a new facility are increasing in the number of citizens who protest the facility. For example, additional environmental impact studies may be required, more legal staff may be needed to respond to interrogatories, and more time and attention may have to be spent on local public relations efforts.

Once we recognize that protests may raise the costs of acquiring a permit, the distribution of citizen attitudes becomes an important factor that may affect the licensing process. This does not occur in Lohmann's model; extremists turn out to protest, but have no effect in equilibrium because the decision-maker optimally discounts protest turnout to account for the expected proportion of extremists in the population. In our model, the proportion of extremists matters because they can impose real costs on the firm.

Lohmann's model is devoid of corporate activity. We study two types of corporate non-market strategy as tools for increasing the likelihood of a license approval. First, we allow for voluntary

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[1] Lohmann (1994) considers a voting model in which citizen action can reduce welfare by introducing noise into a decision procedure that is already optimal. This problem does not arise in the model of Lohmann (1993), which considers the case of a single decision maker.

acts of corporate citizenship that alter community perceptions of the value of the facility, and hence, the number of citizens willing to incur the costs of protesting. These actions might include a commitment to a "clean" technology, or to local community programs of benefit to the general population. The second strategy we consider is to allow the firm to engage in "astroturfing," i.e. subsidizing the political action of citizens who support the proposed facility. This is a form of "signal-jamming" designed to make it difficult for the decision-maker to interpret the political action of local citizens.

Our model provides a unifying framework that explains some existing empirical results. Maxwell, Lyon and Hackett (2000) find that voluntary reductions in toxic chemical emissions are greater in states where higher proportions of residents belong to environmental groups. They interpret this as evidence that there is a greater regulatory threat in states with lots of green group members, and that firms are attempting to preempt this threat. They do not detail the exact nature of the threat, however. Decker (2001) finds that new plant licenses under the Clean Water Act suffer longer delays in states where the proportion of residents in environmental groups is higher. Our model explains both of these observed phenomena, and indeed describes in detail the links between them.

REFERENCES

Decker, Christopher S. 2001. "Corporate Environmentalism and Environmental Statutory Permitting," mimeo, University of Nebraska, Omaha.

Lohmann, Susanne. 1993. "A Signalling Model of Informative and Manipulative Political Action," *American Political Science Review*, 87: 319-332.

Lohmann, Susanne. 1994. "Information Aggregation through Costly Political Action," *American Economic Review*, 84: 518-530.

Maxwell, John W., Thomas P. Lyon and Steven C. Hackett. 2000. "Self-Regulation and Social Welfare: The Political Economy of Corporate Environmentalism," *Journal of Law and Economics*, 43: 583-617.

Merchant Generation: Strategic Foundation and Implication

Nainish K. Gupta

On December 2, 2001, Enron Corporation declared bankruptcy, the single largest bankruptcy in the US energy industry. This bankruptcy has a myriad of effects on the energy industry, ranging from restructurings of off balance sheet asset financings to a lowering of debt. While the actual cause and impact of this event may take years to unravel, this bankruptcy has placed severe strain on the energy sector, particularly, the merchant generation sector[1].

Every company needs to decide its asset strategy. This asset strategy should be driven by the company's overall corporate strategy and strategic intent. Keys to success will be in defining a strategy (or set of strategies) and developing an operating model that is closely linked to the value the company seeks to deliver. The strategy you develop should be robust to meet earnings needs *and* flexible to adapt to changing market conditions.

There is no one "right" strategy to pursue, and the ultimate decision is linked to the opportunities the future merchant generator perceives in the market in combination with the competencies they own or can develop. What is clear, however, is that the chosen strategy must be flawlessly executed. Companies that are in the initial phases of strategy execution and those in the early stages of strategy development need to address a number of fundamental questions:

- What is the value proposition that we are seeking to bring to the market? How does our value proposition differ from that of our competitors?
- Does our strategy make sense in light of market activity? Does our strategy align with our growth goals and our risk profile?
- Is our operating model in synch with our strategy? Do we have the skills and competencies required to implement our operating model?
- What opportunities do we have to add value to our business through alliances, acquisitions, growth, etc.?
- How do we measure performance, and are our incentives in line with these measures?

This paper will attempt to analyze some of the top merchant generators and provide answers to the above questions. Answers to these questions and others, through research and "stress testing" the business plan, will provide direction to launch and maintain a merchant generation company poised for success in the future market.

[1] For the purpose of this paper, we will not distinguish between merchant generators and independent power producers.