Commission Watch

ROE: The Gorilla Is Still at the Door

Incentive regulation is not a cure-all for the continuing controversy over return on equity.

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Regulated utilities are all too familiar with the contentious disputes that surround how the allowed return on equity (ROE) is set in a traditional cost-of-service setting. These disputes, which are reappearing as numerous utility rate-stabilization plans signed as part of deregulation come to an end, are likely to hinge, as always, on the riskiness of utility operating environments.

Moreover, there will likely be the usual disputes surrounding appropriate empirical methods (*e.g.*, discounted cash flow, capital asset pricing model, etc.), the assumptions that underlie those methods (*e.g.*, earnings growth rates, risk premiums, etc.), and appropriate capital structures that balance the lower cost of debt with the higher financial risk of greater leverage. Incentive regulation has sometimes been regarded as a cure-all for these ROE woes, meaning the controversy over what ought to be the utility's ROE will go away. Not hardly.

Within the context of any incentive regulation scheme, establishing an initial, or baseline, allowed ROE is still critical. What changes, however, is how that initial ROE value is used. For example, in a typical price-cap system, a utility's ROE may not be set explicitly. Instead, once the price cap is established,[1] the utility is free to earn as much as possible as long as it maintains prescribed operational and service-quality attributes. But in establishing the price cap itself, a baseline ROE must be defined as part of the utility's cost of service. The question is, how should this initial ROE value be set: Should it be higher, lower, or the same as a correctly set ROE under cost-of-service regulation? The answer depends on a number of factors, all of which boil down to the risk a utility faces under an incentive regulation scheme vis-à-vis a traditional cost-of-service regime.[2]

Risk Comparable to What?

Since the Supreme Court's 1923 decision in *Bluefield Water Works*, later affirmed in the court's 1944 *Hope Natural Gas* decision, the basis for establishing ROE has been "corresponding risk." The court in *Hope* wanted to know whether the return established was equivalent to other firms having corresponding, or comparable, risk to the utility. Although the analytical tools used to determine comparable returns have mushroomed in the 60 years since *Hope* (as have the controversies surrounding those methods),[3] the basic goal has remained a "just and reasonable" ROE.

Under traditional cost-of-service (COS) regulation, a utility's actual cost of service will be determined, in part, by its allowed ROE. In Figure 1 (*see p. 21*), this is shown as the dashed horizontal line, with the ROE set to ROE_0. The actual ROE can differ, of course, declining if the utility's cost of service is higher than expected and increasing if the cost of service is lower than expected. A utility's cost of service subsequently will be adjusted to re-establish an ROE that is consistent with the expected return of investments having similar risk, even though some regulators have mistakenly interpreted this ROE as an absolute ceiling on return, rather than an expected value.[4]

Under incentive regulation (IR), like traditional COS regulation, a utility's realized ROE will depend on its after-the-fact costs. But, unlike COS regulation, earned ROE also depends on the parameters of the incentive mechanism. Specifically, a utility's actual ROE will depend on its baseline costs and how that baseline is set initially to provide the utility with economic incentives to increase its productivity. This differs from COS regulation because, unlike COS regulation, the allocation of above-normal earnings is not explicitly defined.

In Figure 1, the dashed horizontal line reflects COS regulation: the utility is allowed to earn the expected ROE on its prudent investments. The shaded area in Figure 1 refers to earnings under a price cap: relative to the cost of equity the utility could earn under traditional COS regulation, its ROE could fall anywhere within the shaded area. The horizontal portion of the area corresponds to a "dead band," outside of which the utility's earnings can be adjusted to account for normal variation in operation costs. As drawn, therefore, the utility's realized return on equity in the deadband could be either higher, lower, or the same as under traditional COS regulation. The question, therefore, is what objective measures would allow regulators to set the return on equity in that range?

Still Hope?

Implicitly or explicitly, a utility's cost of service will establish the baseline ROE in the dead band. Assuming that this return is set consistent with the "comparable risk" standard established in *Hope*, the answer lies with comparing the utility's risk profile under incentive regulation with its risk profile under traditional COS regulation. This risk profile will depend on a number of factors, including the structure of the market the utility operates within, the structure of the incentive scheme, and the certainty of the incentive scheme. It is important to address the incremental risk associated with IR, since a changing market structure would require adjusting ROE even under COS regulation.

A utility that increases its realized ROE under incentive regulation should not have the incentive system revised simply to ratchet down profits.

Market structure can affect a utility's comparable business and financial risk by changing the shape and volatility of the supply and demand curves that determine earnings and ROE. For example, a distribution-only utility operating in an environment with retail competition probably faces a different risk-reward structure than a traditional, vertically integrated utility in an unrestructured market.[5] The distribution utility's regulatory obligations, such as serving as a provider of last resort and maintaining specific reliability criteria, also will affect its business and financial risk profile. Moreover, its risk profile may be affected by broader federal, regional, or state issues, including FERC-mandated transmission pricing systems, the financial stability of unregulated generation providers (a lá Enron), and the relative economic health of its service area.

The volatility of supply and demand reflects the difference between movements along a supply or demand curve (referred to as changes in the quantity demanded or supplied) versus shifts in the curves themselves. Lowering the price of electricity increases the quantity of electricity demanded by consumers; enticing consumers to purchase home computers for Internet "surfing" increases the demand for electricity at any given price. A vertically integrated utility operating in a closed market faces competition from other providers of energy services (*e.g.*, space and water heat), as well as distributed generation and demand-side management providers. However, the supply and demand curves for electricity and distribution services are complementary: The utility's electricity supply decisions that increase (decrease) the embedded prices it charges will decrease (increase) the quantity of electricity demanded and decrease (increase) the demand for distribution services. How these variations are reflected in earnings will determine the volatility of the utility's earnings under COS and incentive regulation.

The structure of the incentive regulation scheme itself affects risk. A utility that operates under an earnings-sharing mechanism coupled with a price cap will confront a different set of risks than one operating under a revenue cap. Clearly, any incentive scheme that adversely affects a utility's earnings by treating gains and losses asymmetrically will magnify the utility's business and financial risk relative to a symmetric risk sharing that has the same expected return. This will increase the utility's cost of capital and ultimately increase costs to ratepayers.

Additionally, the regulatory incentive structure should be based on the market(s) within which the utility operates. For example, a stand-alone local distribution company faces a different set of financial risks than does a stand-alone transmission company, and both face different financial risks than a ver-

FIGURE 1 COS REGULATION VS. PRICE CAP REGULATION

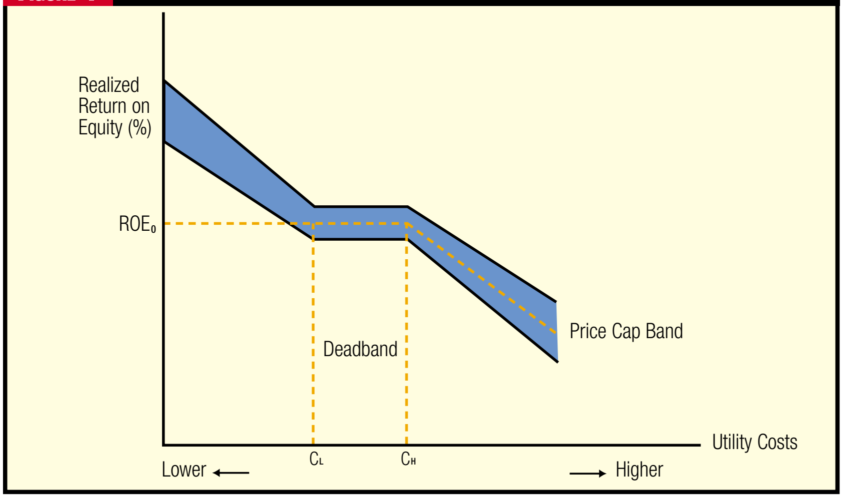


FIGURE 2 VOLATILITY OF RETURNS UNDER COS AND INCENTIVE REGULATION SCHEMES

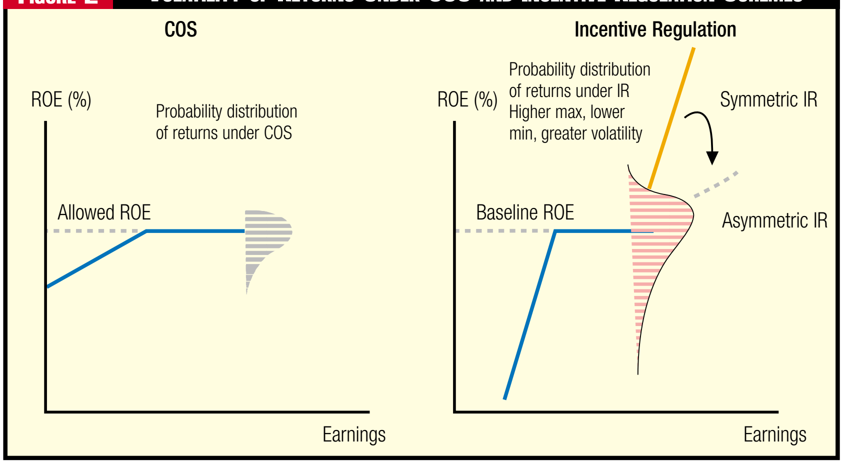
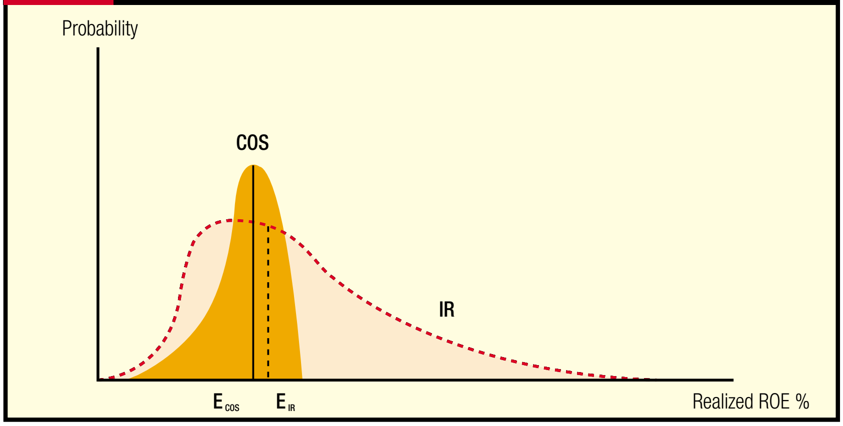


FIGURE 3 COMPARING PROBABILITY DISTRIBUTION OF ROE



tically integrated utility. Moreover, the ability of a distribution-only company to increase productivity (the so-called "X-factor" in many price cap schemes) will likely differ from opportunities for a vertically integrated utility to increase its productivity. Thus, the X-factor itself will affect earnings risk.

Finally, a utility that increases its realized ROE under incentive regulation should not have the incentive system revised simply to ratchet down profits; nor should a utility whose realized ROE declines necessarily have the reins loosened. Any incentive scheme requires time for both the utility and its regulators to adjust. Assuming the incentive regulation scheme is neither toothless nor draconian, financial markets will require some time to evaluate the new risk profile faced by the utility. Impatient regulators who adjust a utility's incentive plan after the first higher earnings report, especially in ways that "raise the bar" for the utility, may be interpreted by financial markets as creating additional financial risk and, just as with asymmetric incentive schemes, ultimately harm ratepayers by increasing the cost of capital.

The net effect of these three factors will be to introduce additional volatility into earnings and realized ROE. This is shown in Figure 2 for both traditional COS regulation and incentive regulation. In both cases, ROE increases as earnings increase. Depending on the vagaries of weather, fuel costs, and other factors affecting supply and demand, there will be a probability distribution associated with the utility's earnings and its realized ROE.

If earnings are capped under traditional COS regulation, as shown on the left-hand side of Figure 2, then the probability distribution of ROE also will be truncated. On the right-hand side of Figure 2, the probability distribution of earnings depends on the symmetry of returns under the IR scheme: If up-side profits are shared with consumers to a greater degree than downside costs, the IR scheme will be asymmetric, and the probability distribution of earnings will be skewed downward. Figure 3 compares two distributions of realized ROE directly. As drawn, the expected ROE under COS regulation, E_{COS}, is less than the expected ROE under incentive regulation, E_{IR}. The actual volatility of ROE under incentive regulation, however, is greater than the volatility under COS regulation, as measured by the overall "spread" of the probability distributions. This risk-return relationship can hold the key to setting a baseline ROE under an incentive regulation scheme.

Measuring Risk vs. Reward

When a baseline ROE is set by regulators, whether under COS or incentive regulation, little attention may be paid to the likely volatility of the realized ROE that will result. Instead, weighing the usual empirical and anecdotal evidence presented by cost-of-capital witnesses like myself, the utility regulator determines an allowed ROE that supposedly provides investors with an expected return that is similar to other firms having the same overall risk.

To truly determine where a utility's baseline ROE should be set under incentive regulation, however, it is critical to evaluate earnings volatility relative to traditional COS regulation. This requires several steps. First, earnings volatility is evaluated under COS regulation. This fairly straightforward exercise can be accomplished by constructing a utility income model that first identifies the factors having the largest impacts on earnings (*e.g.*, fuel prices, weather, etc.) and then randomizes those factors to create an overall probability distribution of earnings and ROE.[6] The utility should determine annual earnings variability over the proposed lifetime of the IR scheme, and also examine the overall probability distribution of the present value of those earnings, based on the utility's current discount rate.

Next, the same exercise can be performed for the proposed incentive regulation scheme. Although measuring ROE volatility associated with the incentive regulation will be less straightforward, as it will depend on the structure of that incentive regulation scheme, an income model tied to the incentive structure can be constructed. For example, suppose the proposed incentive regulation scheme is a price cap with earnings sharing. The utility's ROE will depend on random factors, but also its effectiveness in reducing costs and the specific sharing percentages between customers and shareholders. A given price plus sharing proposal will result in a probability distribution of realized ROE, just as under COS regulation.

The next step is to compare the two probability distributions in order to assess the risk-return tradeoffs for each regulatory scheme, as well as determine whether the incentive scheme is symmetric. Suppose, for example, that the proposed incentive regulation leads to the situation in Figure 3 (*see p. 21*), in which both expected ROE and the volatility of ROE is higher than it would be under COS regulation. While such a result would be consistent with the mean-variance tradeoffs familiar to stock analysis, it doesn't reveal whether the tradeoff is reasonable. For that, a more sophisticated but very doable analysis is required. This analysis evaluates the relative positions of the cumu-

FIGURE 4 CUMULATIVE DISTRIBUTIONS OF REALIZED ROE

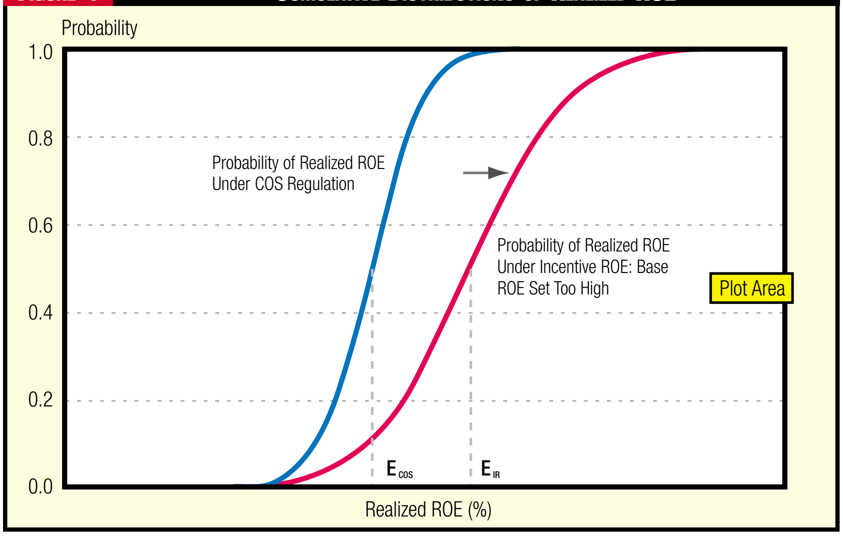
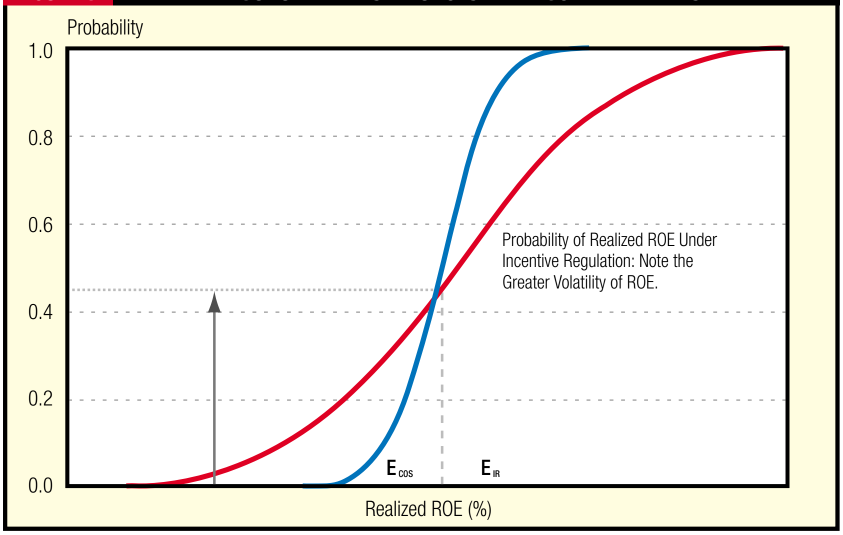


FIGURE 5 CUMULATIVE DISTRIBUTIONS WITH 'COMPARABLE' RISK



lative distribution function (CDF) of ROE under COS and incentive regulation.

Cumulative distributions reflect the probability that a value will be less than a given value. For example, in Figure 3, suppose the expected ROE under COS regulation is 10 percent. We can also determine the probability that ROE is less than any given value. Suppose the probability that actual ROE will be less than 12 percent is 0.90 (*i.e.*, there is a 90 percent chance that the utility's ROE will be less than 12 percent). Similarly, the probability that ROE will be less than 13 percent might be 0.99, and so forth.[7] The cumulative probability distribution just graphs this relationship, as shown in Figure 4.

It turns out that there are well-defined relationships between the "riskiness" of different uncertain outcomes, like a utility's realized ROE, and the position of their CDFs.[8] For example, suppose, as shown in Figure 4, that the CDF under a proposed incentive regulation is always to the right of the CDF under COS regulation. If so, then the utility is absolutely better off with the incentive regulation because it always has a better chance of realizing a higher ROE than under COS regulation. The risk would no longer be comparable. It would be as if the bank were paying a risk-free interest rate on savings accounts that was greater than the highest return that could be achieved in the stock market.

As shown in Figure 4, the CDF with incentive regulation is always below and to the right of the CDF under COS regulation. This situation implies that the base ROE under incentive regulation has been set too high: Given the same underlying conditions, the utility will always realize a higher ROE under incentive regulation. To solve the problem, the utility's base ROE under incentive regulation should be reduced.[9] The effect is shown in Figure 5. Here, E_{IR} is slightly greater than the E_{COS}, but that compensates for the greater volatility of realized ROE under incentive regulation. The next step is to determine whether the difference between the two expected ROEs is "reasonable." To do this, examine the areas under the two CDFs. Moving from the left (*i.e.*, the lowest values of ROE), if the area under the COS regulation CDF is always less than the area under the incentive regulation CDF, then the base rate under incentive regulation is "too high."[10] If so, the base ROE under incentive regulation can be reduced until this is no longer the case. That point represents the upper bound on the base ROE for incentive regulation. The lower bound will be where the expected ROEs are the same, since no investor would prefer incentive regulation if it offered a lower expected ROE and greater uncertainty than under COS regulation. Thus, as long as the volatility of realized ROE under incentive regulation is greater than the volatility of realized ROE under COS regulation, the base ROE under incentive regulation should be set higher than under COS regulation.

Incentive regulation can provide benefits both to utility shareholders and customers by encouraging greater efficiency. But even if incentive regulation supplants traditional COS regulation, regulators and utilities still will need to confront the same basic ROE questions that have vexed both for many years. Because the base ROE under incentive regulation will be an integral part of the incentive structure itself, it ought not to be done as an afterthought. The approach described here is one way to address this important issue.

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Endnotes

1. A typical price-cap, for example, establishes an initial unit price based on the utility's cost of service, then allows for adjustments to that price over time that account for inflation and productivity gains.
2. Traditional cost-of-service regulation has always been directed to improving what economists call "allocative efficiency," which basically refers to setting prices correctly. Incentive regulation, however, focuses more on what economists call "X-inefficiency," which focuses on whether the mix of goods and services is produced at the lowest possible cost. The latter is why incentive regulation usually involves "X-factors" that reflect expected productivity increases.
3. See, for example, my article, "DCF Utility Valuation: Still the Gold Standard?" in the Feb. 15, 2003, issue of *Public Utilities Fortnightly.*
4. This problem was discussed in light of the Supreme Court's 1989 decision in *Duquesne v. Barasch* stemming from a prudence disallowance of the construction costs associated with four canceled nuclear plants. See, A. Lawrence Kolbe and William B. Tye, "The Duquesne Opinion: How Much 'Hope' Is There for Investors in Regulated Firms?" *Yale Journal on Regulation* 8 (1991), at 127.
5. For example, Cragg, *et al.*, argue that a standalone transmission company faces higher risks and thus requires a higher ROE than does a vertically integrated utility. "Assessing the Cost of Capital for a Standalone Transmission Company," *The Electricity Journal*, January/February 2001, pp. 80-88.
6. For example, one could construct a probability distribution of weather and, knowing the historic relationship between weather and electricity sales, develop a simple Monte Carlo model that would generate an overall probability distribution of electric revenues. Although a "how-to" menu of how this is accomplished is beyond the scope of this article, readers interested in additional details should feel free to contact the author.
7. The cumulative distribution is really just the area under the probability curve up to a given value. Therefore, it always lies between 0.0 and 1.0.
8. The technical term is called "stochastic dominance." Interested readers, or those wishing to cure lingering insomnia, are welcome to contact the author for additional information and references.
9. The allocation of benefits between shareholders and customers could also be changed, but this is less likely to occur because it would entail a wholesale reworking of the incentive regulation plan.
10. If this is the case, it turns out that any risk-averse investor will still prefer the incentive regulation scheme.