Yale Journal on Regulation

Volume 8
Issue 1 *Yale Journal on Regulation*

Article 3

1991

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The *Duquesne* Opinion: How Much "*Hope*" is There for Investors in Regulated Firms?

A. Lawrence Kolbe
William B. Tye†

In Duquesne Light Co. v. Barasch, *the Supreme Court ruled that regulatory risks generally require compensation to utility investors, although "slight" losses from changes in the regulatory rules faced by investors are constitutional. However, it will be difficult or impossible to provide the compensation envisioned by the Court if regulators adopt rules of the sort in effect in the 1980s. In particular, traditional procedures for setting allowed rates of return for investors in regulated companies can fall substantially short of the required compensation. As a result, either regulatory institutions will have to change materially from those of the 1980s or material disincentives to new utility investment will persist indefinitely.*

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Introduction

High costs for new electric power plants have led to a series of regulatory and legislative decisions that may retroactively rewrite the rules that utility investors relied upon when they supplied capital for these projects. In *Duquesne Light Co. v. Barasch*,[1] a case involving the recovery of capital invested in constructing nuclear power plants that were ultimately never completed, the Supreme Court upheld one such change.

The effect of this decision is to permit state regulators to shift to investors losses from utility assets that are never used and never shown to be useful. The Court made three key rulings on economic and financial matters:

> First, regulatory policies *and* changes in those policies can create special risks that require compensation for investors;
>
> Second, despite the first ruling, governments can make policy changes that impose uncompensated losses on investors (that is, that "take their property" in the everyday sense of the phrase) as long as the amounts taken are "slight;" and
>
> Finally, the losses suffered by the utility investors in *Duquesne* were slight.

The thesis of this article is that it may prove difficult in practice to provide the compensation for regulatory risks that the first ruling requires, especially given the second ruling that "slight" policy changes are permitted. Specifically, in support of its second key ruling, the opinion cites two definitions of slight,

1. 488 U.S. 299 (1989).

but both recognize only a fraction of the actual loss. If these definitions were accepted as a required precedent, even quite large takings might be dismissed as not of constitutional stature. *Duquesne* may further restrain the start of new investments under the traditional form of ownership in regulated industries.

In the regulatory environment after *Duquesne*, investors are exposed to substantial risks from very large cost disallowances without equivalent opportunities for gain. This asymmetry in regulatory outcomes requires a rate of return in excess of the cost of capital, defined as the expected rate of return in capital markets on alternative investments of equivalent risk. These findings are fully in the spirit of the Supreme Court's express intention in *Duquesne* to reaffirm the teachings of *Federal Power Comm'n v. Hope Natural Gas*.[2] The *Hope* opinion requires that the "return to the equity owner should be commensurate with return on investments in other enterprises having corresponding risks."[3]

This article examines the previously noted key rulings of *Duquesne* and their economic implications for utility investors. In doing so, the authors employ principles of financial analysis to reevaluate what were thought to have been settled economic and constitutional questions concerning the mechanics of public utility regulation. As shown below, the relevant economic concepts require that in the presence of material asymmetric risk, the allowed rate of return be in excess of the cost of capital or that some equivalent "insurance premium" be paid to investors. This conclusion implies the need for substantial change in public utility regulation.

The next three sections describe our path to this conclusion. The facts and opinion of *Duquesne* represent a particularly interesting example of the economic issues. We also find that the Court's opinion in many respects demonstrates a more sound understanding of the relevant concepts than is embodied in current practice and much expert opinion. The first section therefore introduces the subject with a fairly detailed discussion of the circumstances of the case before the Court and the logic of the opinion. Because a clear understanding of the issues requires a sound understanding of the relevant economic principles, the second section develops the essential concepts of financial economics. The third section applies these principles to the issues identified in the first section. A concluding section looks at the implications for regulation and the utility industry.

I. *Duquesne*

At issue in *Duquesne* was a state statute that was used to deny recovery of capital invested in several nuclear plants by use of a new "used and useful"

2. 320 U.S. 591 (1944).
3. *Id.* at 603.

test.[4] The particular legal question facing the Court was whether the statute violated a prior "regulatory contract"[5] and thereby represented an unconstitutional taking of property. The Court held that under the "end result" test,[6] the new rules did not reach the stature to constitute a taking in this case. The decision also left considerable room for future regulatory discretion.[7]

A. Hope *and the Traditional Economic Paradigm of Rate Regulation*

Rate of return and rate base methodology for the regulated firm is probably the oldest issue in rate regulation.[8] Without some idea of whether the rate of profit as a percent of asset value is high or low, the regulator has little idea of whether the regulated firm's market power (if any) is constrained by regulation.

Between 1898 and 1944, the Court handed down a number of decisions on whether the original cost or the fair value of an investment was the better rate

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4. In this context, "used and useful" means the plants are completed and used to provide service to customers. See Kahn, *Who Should Pay for Power Plant Duds?*, WALL ST. J., Aug. 15, 1985, at 26, col. 3, and Pierce, *The Regulatory Treatment of Mistakes in Retrospect: Canceled Plants and Excess Capacity*, 132 UNIV. PA. L. REV. 497-560 (1983).

5. For some time it has been recognized that from an economic point of view, regulation may be thought of as an implicit contract governing long-term relationships between buyers and sellers. *See* V. Goldberg, *Regulation and Administered Contracts*, 7 BELL J. ECON. 426-48 (1976). Fair regulation has generally proscribed the use of "retroactive ratemaking" to revise the observed results of a previously agreed upon ratemaking approach. As Bonbright's classic text puts it, fairness to ratepayers and investors usually means consistently implementing a previous understanding of the rules of the game:

> The meaning of "fairness" in business transactions is most clearly definable when referring to a moral obligation, which may also be a legal obligation, to avoid deception and to live up to previous commitments, expressed or implied. If judged by this test alone, any rule of rate making would be fair to investors, whatever its merits or demerits on other grounds, if it conforms to the terms, on the faith of which the investment was originally made—fair no matter how onerous or how profitable these terms may prove to be in the light of hindsight.

J. BONBRIGHT, PRINCIPLES OF PUBLIC UTILITY RATES 127 (1961).

6. The end result test refers to the Supreme Court's statement in *Hope*:

> Under the statutory standard of "just and reasonable" it is the result reached not the method employed which is controlling [citations omitted]. It is not theory but the impact of the rate order which counts. If the total effect of the rate order cannot be said to be unjust and unreasonable, judicial inquiry under the Act is at an end. The fact that the method employed to reach that result may contain infirmities is not then important.

320 U.S. at 602 (citations omitted).

7. The *Duquesne* decision states that "the Constitution within broad limits leaves the States free to decide what rate-setting methodology best meets their needs in balancing the interests of the utility and the public." 488 U.S. at 316.

8. A. KAHN, 1 ECONOMICS OF REGULATION 20 (1970), states that "price regulation is the heart of public utility regulation" and discusses how that proceeds from a determination of the appropriate rate base and rate of return. He also discusses the history of the debate. *See id.* at 35-54.

base.[9] The Court seemingly resolved the matter in *Hope*. According to *Hope*, what mattered was the "overall effect," "total effect," or more commonly, the end result.[10] The use of an original cost less depreciation rate base was found to satisfy this test. Following *Hope*, the rate base became essentially a known quantity: prudently invested original cost less depreciation.[11] The focus of debate then became the determination of the appropriate rate of return.[12] If investors were to be compensated for differences in risk and inflation, the adjustment would be to the rate of return, not the rate base.

Given a fixed investment base, pricing of the services of regulated industries was historically done on a bottom-up "cost of service" basis, whereby the firm's expenses were added to an allowance for interest, profit, and income taxes on the prudent original cost investment base. The *Hope* court endorsed its earlier definition of the profit component in *Bluefield Waterworks & Improvement Co. v. Public Service Comm'n.*[13] *Bluefield* had held that a regulated firm

> is entitled to such rates as will permit it to earn a return on the value of the property which it employs . . . equal to that generally being made . . . on investments in other business undertakings which are attended by corresponding risks and uncertainties.[14]

Hope itself required that the investor's return be commensurate with returns on equally risky investments in other enterprises.[15] The modern economic view is that this condition is satisfied when investors expect to earn the cost of capital,[16] defined as "the expected rate of return in capital markets [for

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9. See *infra* note 36, for a discussion of this important debate over the fundamental concepts of ratemaking. *See also* KAHN, *supra* note 8, at 38-41.

10. *Hope*, 320 U.S. at 602.

11. The prudent original cost test had been advocated for some time by Justice Brandeis. *See* Missouri *ex rel.* Southwestern Bell Tel. Co. v. Public Service Comm'n, 262 U.S. 276, 292 (1923) (Brandeis, J., concurring). Some states kept fair value rates bases by statute, but a common belief is that regulatory commissions in these states tried to set the rate of return on those fair value rate bases so the end result in each year was the same that would have been reached with an original cost rate base and a rate of return appropriate for that. We cannot verify or refute this view, but we assume that it is correct for purposes of this paper, at least for electric utilities. Recently there have been attempts at non-original-cost rate bases with different end results year by year. Perhaps the leading example is the Federal Energy Regulatory Commission's "trended original cost" rate base for oil pipelines. See Myers, Kolbe, & Tye, *Inflation and Rate of Return Regulation*, 2 RES. TRANSP. ECON. 83-119 (1985), for discussion of the economics of original cost versus trended original cost. All of the fundamental conclusions of the present paper remain true under trended original cost, but some of the implementation details would change.

12. Duquesne Light Co. v. Barasch, 488 U.S. 299, 312 (1989).

13. 262 U.S. 678 (1923).

14. *Id.* at 692.

15. *Hope*, 320 U.S. at 603.

16. See Myers, *Application of Finance Theory to Public Utility Rate Cases*, 3 BELL J. ECON. 58-97 (1972) for the modern economic definition of a "just and reasonable" rate of return.

example, the New York Stock Exchange] on alternative investments of comparable risk."[17]

Thus, in the traditional economic paradigm of rate regulation, customers expect to pay (and investors to earn) a just and reasonable rate of return on the actual costs of investments, which are recorded in the firm's rate base. These costs might be higher or lower than originally expected, but all are put in the rate base as long as they were prudently incurred. Hence the term, pure prudent investment rule.

B. *Background to the* Duquesne *Decision*

In 1967, Duquesne Light Company and four other utilities joined a venture (CAPCO[18]) to construct seven nuclear generating units. In 1980, four of the plants were canceled because of the economic and political impacts of the Arab oil embargo, the accident at Three Mile Island, and other intervening events.[19]

In 1982, the Pennsylvania Public Utilities Commission (PUC) approved the amortization of the investment in canceled plants over a 10-year period through rate increases beginning in 1983. However, about a month before the close of the rate case in 1982, the Pennsylvania legislature enacted a law that precluded inclusion of costs of construction of facilities in rate bases, prior to the time such facilities were "used and useful in service to the public."[20]

A consumer group sued Duquesne Light and the PUC under the new law. In the ensuing litigation, the PUC maintained that its decision to permit amortization of the aborted plants (and thus permit a return *of* investment) without inclusion in the rate base[21] (and thus not provide a return *on* investment), complied with the new Act. The Pennsylvania Supreme Court disagreed and held that the statute prohibited both a return of and a return on invested capital.

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17. *See, e.g.*, R. BREALEY & S. MYERS, PRINCIPLES OF CORPORATE FINANCE ch. 7 (3rd ed. 1988); A. KOLBE, J. READ, & G. HALL, THE COST OF CAPITAL ch. 2 (1984).

18. "CAPCO" stands for Central Area Power Coordination Group. Duquesne Light and Pennsylvania Power Company participated with three other utilities.

19. As a result of the Arab oil embargo, the price of energy increased, which drove up the price of electricity and drove down the rate of growth of electric demand and hence the need for the projects contemplated by CAPCO. The accident at Three Mile Island, of course, raised questions about the future of nuclear power. For a discussion of the change in economic environment that made certain investments unused and unuseful, albeit prudently made, see Jersey Central Power & Light Co. v. Federal Energy Regulatory Comm'n, 810 F.2d 1168 (D.C. Cir. 1987).

20. The statute states:

> the cost of construction or expansion of a facility undertaken by a public utility producing . . . electricity shall not be made a part of the rate base nor otherwise included in the rates charged by the electric utility until such time as the facility is used and useful in service to the public.

66 PA. CONS. STAT. ANN. § 1315 (Purdon Supp. 1988).

21. Approved investor cash flows = [(the allowed rate of return) x (the undepreciated cost of the assets employed, called the rate base)] + an annual depreciation charge.

In so doing, that court held that the law did not violate the "takings" clauses of the Fifth and Fourteenth Amendments.[22]

C. *Critical Parts of the Opinion*

The U.S. Supreme Court affirmed the Pennsylvania Supreme Court decision. The precise language of the *Duquesne* opinion must be read very carefully if we are to understand its meaning. Because terms may have different meanings for judges and financial economists, and because it will be convenient to refer to these rulings throughout the remainder of this article, we quote at length from the opinion.

The Court held that a state utility regulatory scheme "does not 'take' property simply because it disallows recovery of capital investments that are not 'used and useful in service to the public.'"[23]

The Court then noted that according to the initial evaluation of the utilities' actions, "'the CAPCO decisions in regard to the [canceled plants] at every stage to their cancellation, were reasonable and prudent.'"[24] Whether a rate would pass muster as "just" and "reasonable," however, would "depend to some extent on what is a fair rate of return given the risks under a particular rate-setting system, and on the amount of capital upon which the investors are entitled to earn that return."[25]

The modified regulatory regime in effect before the new statute raised the risks of investing in the utility. The Court assumed, however, that the regime compensated for the increased risk by revising the rate of return.

> Pennsylvania has modified the [pure prudent investment[26]] system in several instances, however, when prudent investments will never be used and useful. For such occurrences, it has allowed amortization of

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22. Regulatory standards for ratemaking have ultimately been derived by the courts from two provisions in the U.S. Constitution:

(1) [N]or shall private property be taken for public use, without just compensation. U.S. CONST. amend. V, cl. 4.

(2) [N]or shall any State deprive any person of . . . property, without due process of law. . . . U.S. CONST. amend. XIV, cl. 3.

The Supreme Court asserted its jurisdiction over the reasonableness of railroad rates in Chicago, Milwaukee & St. P. Ry. v. Minnesota, 134 U.S. 418 (1890) and reaffirmed its responsibility under the Fourteenth Amendment in Smyth v. Ames, 169 U.S. 466 (1898). The methodology adopted in Smyth v. Ames was overturned by Federal Power Comm'n v. Hope Natural Gas Co., 320 U.S. 591 (1944), but not the requirement that rates be in accord with the Fifth and Fourteenth Amendments.

23. *Duquesne*, 488 U.S at 300, 307-16.

24. *Id.* at 305.

25. *Id.* at 310.

26. We identify below the four regulatory systems that the Court distinguishes. *See infra* at 121.

> the capital lost, but does not allow the utility to earn a return on their investment. . . . The loss to utilities from prudent but ultimately unsuccessful investments under such a system is greater than under a pure prudent investment rule, but less than under a fair value approach. Pennsylvania's modification slightly increases the overall risk of investments in utilities over the pure prudent investment rule. *Presumably the PUC adjusts the risk premium element of the rate of return on equity accordingly.*[27]

A theoretical inconsistency in a particular rate, in and of itself, was held not to be subject to constitutional question if the rate was otherwise reasonable. "Inconsistencies in one aspect of the methodology have no constitutional effect on the utility's property *if they are compensated by countervailing factors in some other aspect.*"[28]

While the move from one regulatory regime to another could run afoul of the Constitution, the Court stated that Pennsylvania's action did not.

> *The risks a utility faces are in large part defined by the rate methodology* because utilities are virtually always public monopolies dealing in an essential service, and so relatively immune to the usual market risks. Consequently, a State's decision to arbitrarily switch back and forth between methodologies in a way which required investors to bear the risk of bad investments at some times while denying them the benefit of good investments at others would raise serious constitutional questions. But the instant case does not present this question.[29]

According to the Court's calculation, the impact of the switch upon investors and the utilities was not significant.

> In fact the overall effect is well within the bounds of *Hope*, even with total exclusion of CAPCO costs. Duquesne[30] was authorized to earn a 16.14% return on common equity and an 11.64% overall return on a rate base of nearly $1.8 billion. Its $35 million investment in the canceled plants comprises roughly 1.9% of its total base. The denial of plant amortization will reduce its annual allowance by 0.4%.[31]

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27. *Duquesne*, 488 U.S. at 311-12 (emphasis added).
28. *Id.* at 314 (emphasis added).
29. *Id.* at 315 (emphasis added).
30. Pennsylvania Power Company was also an appellant, and its stated losses were of similar magnitude.
31. *Duquesne*, 488 U.S. at 311-12 (citation omitted).

The Court thus held that the losses suffered were sufficiently "slight" to avoid Constitutional questions under the takings doctrine.

> Given these numbers, it appears that the PUC would have acted within the constitutional range of reasonableness if it had allowed amortization of the CAPCO costs but set a lower rate of return on equity with the result that Duquesne and Penn Power received the same revenue they will under the instant orders on remand. The overall impact of the rate orders, then, is not constitutionally objectionable. No argument has been made that these *slightly reduced rates* jeopardize the financial integrity of the companies, either by leaving them insufficient operating capital or by impeding their ability to raise future capital. Nor has it been demonstrated that these rates are inadequate to compensate current equity holders for the risk associated with their investments under a modified prudent investment scheme . . . . An otherwise reasonable rate is not subject to constitutional attack by questioning the theoretical consistency of the method that produced it.[32]

D. *Regulatory Risk in Four Ratemaking Regimes*

In reaching these conclusions, the Court distinguished four regulatory ratemaking regimes. Under (1) the *pure prudent investment* standard, all prudent investments go into the rate base regardless of whether they are used or useful.[33] The investor thus would receive both a return *of* and a return *on* capital for the canceled plants.

Under (2) the *modified prudent investment* standard, unused and unuseful investments were amortized but did not go into the rate base. The investor would have received a return *of* but not *on* the unused and unuseful investment under this second standard. According to the Court, this was the standard in

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32. *Id.* at 312-14 (footnote omitted) (emphasis added).
33. The Court stated this approach in the following passage:

> Justice Brandeis had advocated an alternative approach as the constitutional minimum, what has become known as the "prudent investment" or "historical cost" rule. He accepted the Smyth v. Ames eminent domain analogy, but concluded that what was "taken" by public utility regulation is not specific physical assets that are to be individually valued, but the capital prudently devoted to the public utility enterprise by the utilities' owners . . . . Under the prudent investment rule, the utility is compensated for all prudent investments at their actual cost when made (their "historical" cost), irrespective of whether individual investments are deemed necessary or beneficial in hindsight. The utilities incur fewer risks, but are limited to a standard rate of return on the actual amount of money reasonably invested.

Duquesne, 488 U.S. at 309 (footnote omitted) (Citing Missouri v. Public Service Comm'n 262 U.S. 276, 291 (1923)).

effect before the new law was passed.[34] Investors' expectations under this second standard were not fulfilled, but not because the investments turned out to be unused and unuseful. They were unfulfilled because the modified prudent investment test was revoked by the state legislature at the last minute and replaced by another test.

This latter test is called (3) the *used and useful* test.[35] Under this standard the investor received neither a return of nor a return on the canceled plants.

The Court discussed a fourth test, which it labeled (4) *fair value*[36] and defined as follows:

> In theory the *Smyth v. Ames* fair value standard mimics the operation of the competitive market. To the extent utilities' investments in plants are good ones (because their benefits exceed their costs) they are rewarded with an opportunity to earn an "above-cost" return, that is, a fair return on the current "market value" of the plant. To the extent utilities' investments turn out to be bad ones (such as plants that are canceled and so never used and useful to the public), the utilities suffer because the investments have no fair value and so justify no return.[37]

The Court ranked the four rate base methodologies according to the risks to which investors were exposed. Pure prudent investment insulated investors from both upward and downward future revaluations of the investment base and thus incurred "fewer risks."[38] The modified prudent investment standard

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34. The utilities asserted that they had historically been on the pure prudent investment standard, but did not contest the disallowance of a return on investment, leading to the Court's finding that the utilities were constructively acting under the modified prudent investment rule. *Duquesne*, 488 U.S. at 311-12. An explanation consistent with the utilities' view and their failure to protest is that they felt the modified prudent investment treatment was the best they could hope to attain in the current political climate and that protesting it might increase the chance of even more severe treatment.

35. Under the used and useful test, only assets which are "used and useful in service to the public" will generate a return on and return of investment in the allowed revenue requirement, regardless of whether or not the investment was prudent. In the case of CAPCO it was ruled that the investments in question were unrecoverable in rates because the plants were abandoned, even though it was ruled that the decision to incur the costs was prudent. For a discussion of the move toward this test, see Hoecker, *"Used and Useful": Autopsy of a Ratemaking Policy*, 8 ENERGY L.J. 303 (1987).

36. We use the Court's characterization for the purposes of this paper, but there have been many definitions of the term fair value. Indeed, this was responsible for much of the problem of implementing the standard. The fair value standard emerged from the Supreme Court's decision in Smyth v. Ames, 169 U.S. 466 (1898), where the Court listed a number of factors which could be used to ascertain that value. A. KAHN, *supra* note 7, at 38, states the consensus opinion that "Smyth v. Ames [was] the bane of public utility regulation for the next 50 years, embroiling commissions and courts in endless controversies about the measurement of fair value." The Court in *Duquesne* states that the fair value standard "suffered from practical difficulties which ultimately led to its abandonment as a constitutional requirement." 488 U.S. at 310. The *Hope* test effectively replaced the fair value rate base with prudent original cost, and the debate among the interested parties thereafter focused on the rate of return to be applied to that rate base. Under the net original cost system that came into wide use in the years following *Hope*, the rate base until recently was subject to much less controversy than under Smyth v. Ames.

37. *Duquesne*, 488 U.S. at 308-09.

38. *Id.* at 309.

exposed investors to some loss. Under this test, they could be denied a rate of return on unused and unuseful investments but could still recover the investment itself. The Court ranked this standard as "slightly" more risky than the first test.[39]

Under the used and useful test, investors could lose everything but had no prospect of capital gains if the investment was particularly valuable. The fourth test, fair value, also presented substantial risk since asset revaluations could go up or down depending on subsequent economic developments.

Inasmuch as investor risk increased with movements from pure prudent investment to modified prudent investment to the used and useful test, the allowed rate of return would have to increase accordingly. Fair value was ranked higher in terms of risk than pure prudent investment because investors were exposed to capital gains and losses. The Court noted that potential losses were greater under fair value than under modified prudent investment, but did not explicitly rank the fair value test overall for risk.

The Duquesne utility's investment decision and the PUC's initial determination of rate of return were made under the modified prudent investment rate base methodology, which the Court found to be in effect in 1967.[40] The Pennsylvania legislature, however, enacted the much riskier used and useful rate base test some fifteen years later. Application of that test, the issue decided by the Court in *Duquesne*, bears implications for investors and for utilities' ability to raise capital.

II. Economic Groundwork

This Part of the Article sets out the economic terms and arguments upon which our analysis relies. We define four terms: (1) promised rate of return; (2) expected rate of return; (3) realized rate of return; and (4) regulatory risk. To define regulatory risk, which comes in two varieties, we contrast the traditional economic paradigm of rate regulation with the regulatory rules endorsed by *Duquesne*. We also examine whether regulators typically allow an expected or a promised rate of return on equity.

A. *Expected Versus Promised Returns in Competitive Capital Markets*

The concept of a promised rate of return can be illustrated by corporate bonds. Consider a "junk bond," i.e., one with an appreciable risk of default. The borrower promises investors a relatively high return, say 13.5% for this example; but the return investors expect is lower, because they know the

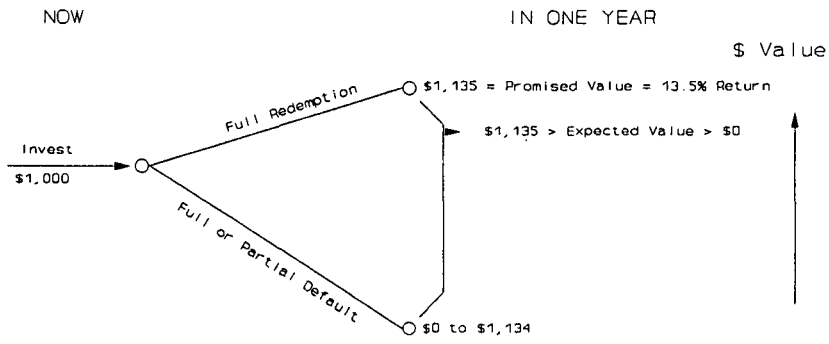
39. *Id.* at 311-12.

40. This was disputed by the utilities, but the original PUC order was not protested on these grounds.

borrower may default, i.e., fail to redeem the bond for the full promised amount. The situation is illustrated in Figure 1. The realized rate of return on the junk bond, i.e., the actual rate of return that is in fact observed at some future date, can never exceed 13.5% but may go substantially below it.

Figure 1

PAYOFF POSSIBILITIES ON A ONE-YEAR JUNK BOND

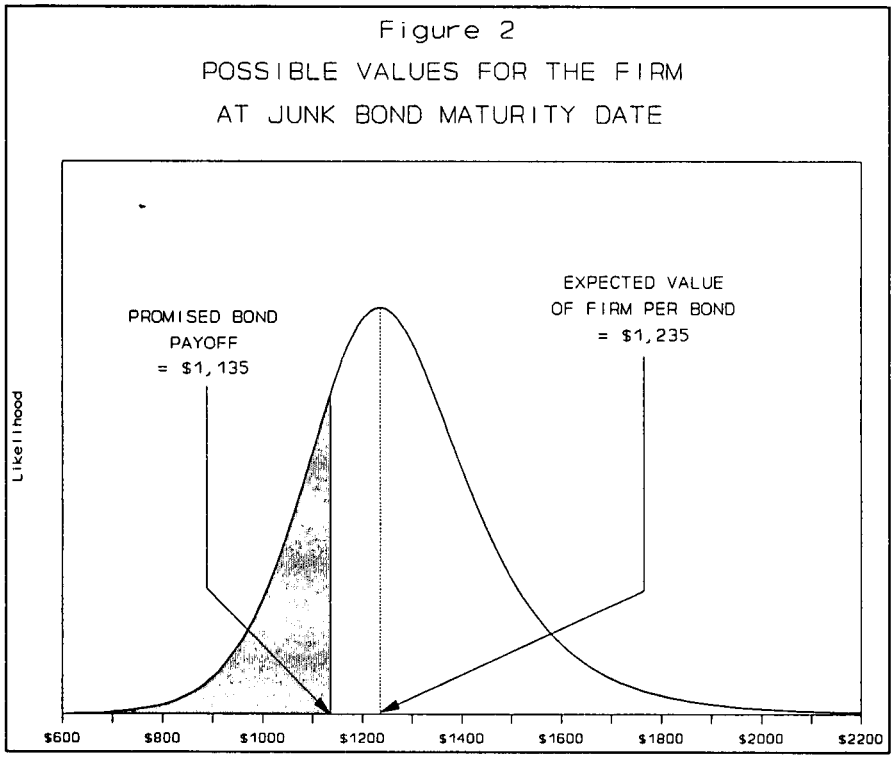


Expected Value Lies Between Promised Value and Zero, and Depends on Odds of, and Amount Recovered in, Default. Value of Bond Today = Amount Invested = $1,000.

To determine the expected rate of return on the bond, we must know more about the likelihood of possible outcomes. For example, suppose the bond is offered at a price of $1,000, that it will be redeemed in one year when both principal and interest are paid, and that lenders agreed to pay the issue price of $1,000 for the bond. The curve in Figure 2 depicts a hypothetical distribution of the firm's possible future asset values. Clearly, the bondholders will be paid the promised 13.5% only if the value of the firm at the end of the year is at least $1,135 per bond sold. If the value is less, the firm will default or renegotiate, and the bondholders will receive less than $1,135.

In this example, the expected value of the firm one year hence is $1,235 per bond, $100 more than bondholders have been promised. But the firm may be worth a lot less. If the realized value ends up to the right of the $1,135 point, the value of the firm is high enough to pay off bondholders and have money left over. But to the left of the $1,135 point, bondholders are not paid in full.

The area under the curved line between any two asset values represents the probability that the firm will have a future realized value in a particular range. So, the total area under the line to the left of the $1,135 point, the shaded region, is the probability that bondholders will receive less than the

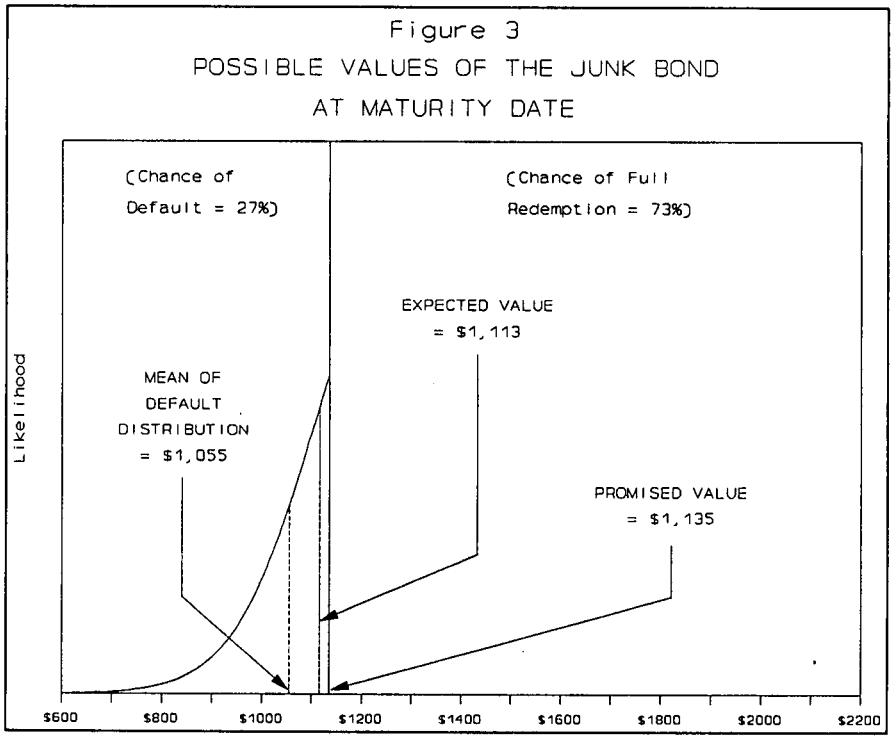


promised rate of return. In Figure 2, we assume this probability is 27%. This shaded area is the only range of relevance to bondholders: whether the firm is worth $1,136 or $100,136 per bond, bondholders get no more than $1,135. Thus the
distribution of possible realized returns to bondholders is *asymmetric*, skewed to the left in the figure.

Figure 3 plots this area of possible realized returns to bondholders. It depicts an asymmetric distribution of payoffs to bondholders ranging up to $1,135. As we assumed above, there is a 73% chance that bondholders will be given $1,135 and a 27% chance that they will receive something less. The "something less" distribution depicted in Figure 3 has a mean of $1,055. Thus, the expected return to bondholders is 11.3%, not the promised 13.5%.[41] By

41. That is, 0.73 x $1,135 + 0.27 x $1,055 = $1,113. Therefore, the expected rate of return is: [(1,113/1,000) - 1.0)] = 11.3%.

comparison, the expected rate of return on a one-year, default-risk-free Treasury note might be 8 or 9%.[42]



Is 11.3% "fair," given the risk? It is if bondholders willingly paid $1,000 for the bond in the first place.[43] If the risk is too great at only an 11.3% expected rate of return, however, investors will offer less than the $1,000 issue price of the bond. This raises the promised rate of return above 13.5% and the expected rate to a level investors consider fair given the risk. For example, if investors are only willing to offer $980 for the claim on the payoff possibilities depicted in Figure 3, the promised rate of return rises to 15.8% and the expected rate of return to 13.6%.

42. These yields are intended only to be illustrative, since the relationship among interest rates of different risk and the level of interest rates changes materially as economic conditions change. For example, promised junk bond yields were in the 15-16% range for much of 1990, while seven-year Treasury securities were in the 8-9% range. But after the Iraqi invasion of Kuwait, junk bond yields began to climb sharply, to 20% by mid October, even though seven-year Treasury yields remained below 9%. *Junk Bond Yields Go Through the Roof*, Wall St. J., Oct. 11, 1990, at C1, col. 1.

43. In the remainder of the Article we use "fair return" in this sense. A fair return thus implies that the present value of the future cash flows that investors expect from the investment equals the amount they initially invested.

The discussion above should help to distinguish the fair allowed rate of return under traditional rules of rate regulation from the fair allowed rate of return under the rules endorsed in *Duquesne*.

B. *Regulatory Risk*

The traditional paradigm of rate regulation, described in the Introduction, came under pressure from forces such as oil price shocks, double-digit inflation, uncertain electric demand, and changing and retroactive safety standards for plants under construction, particularly nuclear plants. The *average* cost of electricity went higher, and the *range* of possible outcomes widened.[44]

As a result of these forces, regulatory rules often changed. Regulators interpreted prudence standards to mean that economic disasters required "sharing" of risks between investors and ratepayers.[45] They also disallowed unused and unuseful investments, however prudently incurred, from the rate base and in some cases forced investors to bear the amortization costs as well.[46] As *Duquesne* also illustrates, in some cases these decisions involved retroactive changes in regulatory rules that shifted more risk to investors after the cards were face up and sometimes without specific regard to whether such risks were explicitly contemplated by the rate of return methodology applied prior to the switch.

The critical point is that the rate base, previously a largely known quantity not subject to significant risk, became a highly uncertain quantity, and the direction of movement in asset values was strictly downward. Under the new rules, investors might not be allowed to earn a return on all of the capital invested, because some of the investment might not be allowed in the rate base. Good outcomes, however, were still treated under the old rules: investors expect a return equal to the cost of capital. Thus, the new rules of rate regulation apparently approved by the *Duquesne* decision create asymmetric returns for utility investors analogous to those for junk bondholders.[47]

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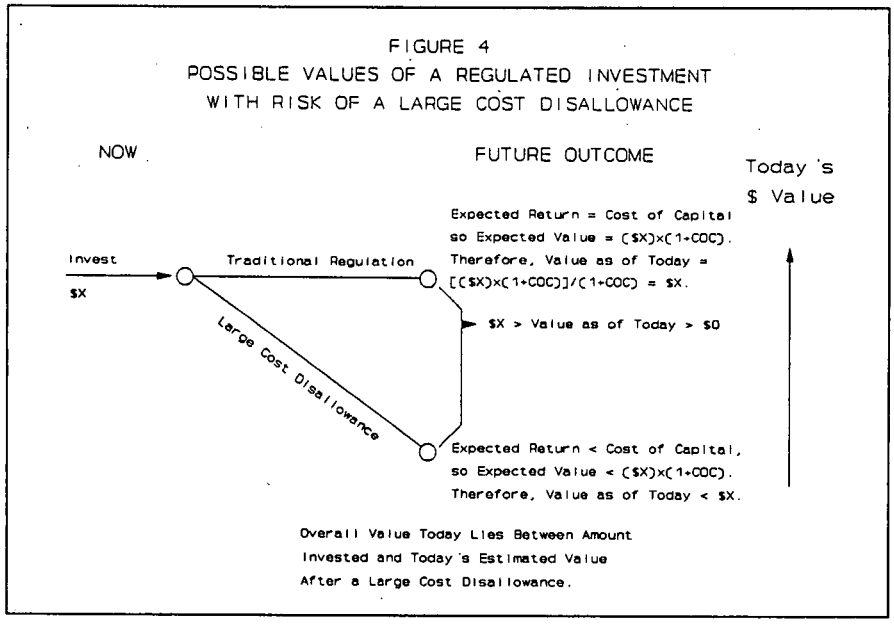
44. For a survey of the effect of these developments on the industry, see Cook, *Nuclear Follies*, FORBES, Feb. 11, 1985, at 82.

45. *See* Tye, *Prudent Investment in Large Complex Projects: The Case of the TransAlaska Pipeline System*, 57 TRANSP. PRAC. J. 17 (1989).

46. For an extensive survey of these cases, see Berlin, *Excess Capacity, Plant Abandonments and Prudence: The Appropriate Regulatory Standard*, PUB. UTIL. FORT. Nov. 22, 1984, at 26-31, and Pierce, *The Regulatory Treatment of Mistakes in Retrospect: Canceled Plants and Excess Capacity*, 132 U. PA. L. REV. 497 (1984). For examples of the large disallowances, see *In re* Public Serv. Co., 130 N.H. 265, 539 A.2d 263 (1988), *appeal dismissed*, 109 S. Ct. 858 (1989); Cleveland Elec. Illuminating Co. v. Public Util. Comm'n, 4 Ohio St. 3d 107, 447 N.E.2d 746, *appeal dismissed*, 464 U.S. 802 (1983); Consumers' Counsel v. Utility Comm'n, 67 Ohio St. 2d 153, 423 N.E.2d 820 (1981), *appeal dismissed sub nom.*, Cleveland Elec. Illuminating Co. v. Consumers' Counsel, 455 U.S. 914 (1982).

47. As discussed below, regulatory institutions have long embodied a certain degree of asymmetry in returns. For example, the Court in *Duquesne* found that the modified prudent investment standard was previously in effect. The issue under traditional regulatory rules is whether these risks were *material*. In this Part of the Article we assume the initial rules are symmetric to simplify the exposition.

The result is asymmetric regulation, with the type of payoff structures depicted in Figure 4. If everything goes as planned, investors expect the full investment to be put in the rate base and to earn an exactly fair return, so the value of the plant to them as of today equals the amount invested.[48] A familiar theorem of rate regulation says that if regulators set the allowed rate of return so investors expect to earn the cost of capital on the approved rate base, the value of the firm will equal the value of the rate base.[49] But if some of



the investment is disallowed, they expect a lower return. If in one outcome the plant is worth exactly what it cost and in the other it is worth less to investors than it cost, on average it will be worth less to investors than it cost.

Figure 4 is the embodiment of the point we are making, and many of the objections we have received to earlier drafts of this article[50] stem from a failure to appreciate the elementary logic of Figure 4. The point could not be more basic: if in one outcome investors get a payoff equivalent to just getting their initial money back, which by the simple mathematics of Figure 4 is true

48. In Figure 4, *infra*, and Figure 7, *infra*, we make use of the most basic valuation formula: the value today of an expected cash flow to be received one year hence equals the expected cash flow divided by one plus the cost of capital. More elaborate present value formulas might be substituted for this simple one, but their use would lead to exactly the same conclusions. *See generally* BREALEY & MYERS, *supra* note 17, ch. 5-6.

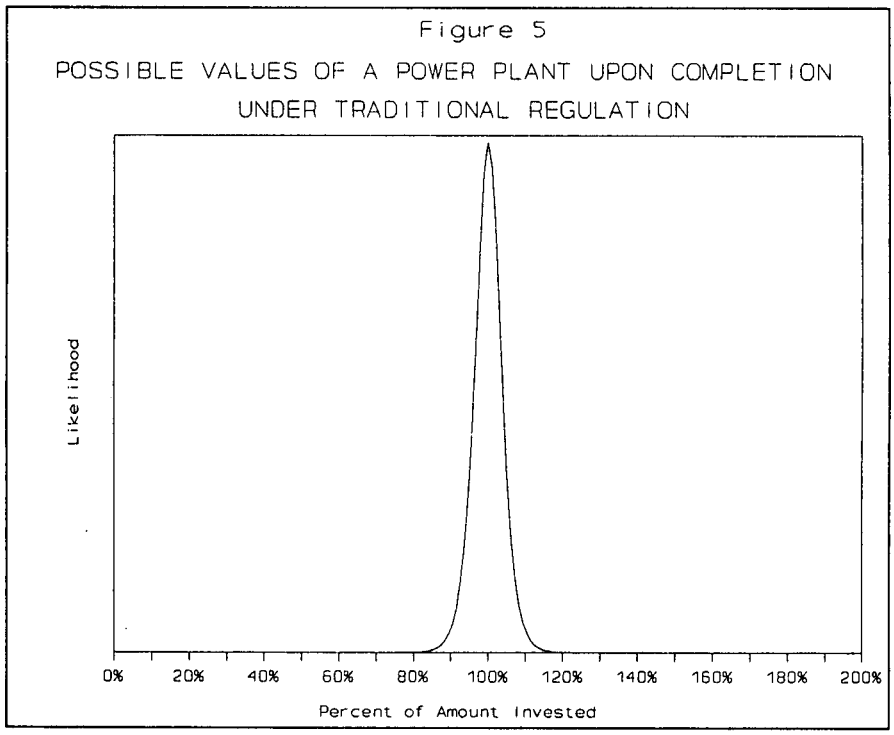
49. See Myers, *supra* note 16, at 73-76, for a discussion of this theorem and its implications. See KOLBE, READ, & HALL, *supra* note 17, at 20-33, for a proof and a discussion of the component concepts.

50. *See infra* Part III (F).

regardless of the magnitude of the cost of capital, and in the other outcome they get less, they face a losing game.

The actual outcomes in Figure 4 are stated in terms of *expectations*. Therefore, by definition there is a chance investors will get more or less than they expect on the upper branch, under the traditional regulation outcome. This merely reflects the fact that even under traditional regulation, there are always deviations of realized values from a precisely cost-based rate in practice. For example, rates are set periodically and investors are free to win or lose during the "regulatory lag" between hearings.[51] Thus the value of a plant to investors upon completion may turn out to differ somewhat from its cost.

The existence of different possible realized asset values under traditional prudent investment regulation, which changes none of our conclusions, is shown in Figure 5. This figure depicts investors' uncertainty today about how



valuable the investment may actually turn out to be in the future, when it is completed. That is, a plant may turn out to be worth more or less than its cost

51. Myers, *supra* note 16, at 83-84, advocates conscious use of regulatory lag as an incentive for cost efficiency.

due to normal variations in the way regulation is applied.[52] Note that for the purpose of illustrating the relevant principles, Figure 5 initially makes the common assumption that there is a symmetric distribution of future realized asset values around the cost.[53] This is based on the assumption of a regulated monopoly where there is no bias in actual earnings either upward or downward from the allowed rate of return.[54] This simplifying assumption is relaxed below to consider the more general case of asymmetric distributions of realized values even under a prudent original cost standard.

If a rate base disallowance occurs, the range of outcomes is wider and the plant is worth less than it cost on average. Figure 6 adds an illustrative distribution of possible outcomes with disallowances to the traditional case of Figure 5. There is a material chance the plant will be worth nothing and little chance it will turn out to be worth what it cost.[55] What this means for investors depends on the magnitude of the risk of a disallowance. For example, Figure 6 shows the plant value distribution assuming a 20% chance of a disallowance.[56] This produces an expected value of 87% of cost, not 100%.[57] Under

52. We have made no assumption about just how this distribution of values is generated. A standard approach would be to assume the value will be given by the expected future investor cash flows upon completion, discounted by the then-current cost of capital. Another somewhat different shape for Figure 5 would result if we assumed that under traditional regulation, the range of values of the project was wide, but that ratepayers had a "call option" on good outcomes and that investors had a "put option" to ratepayers for bad outcomes. If the "exercise prices" of the call and put were equidistant from the mean, a narrow, symmetrical, truncated distribution would result. For present purposes, however, we need not speculate on the "true" shape of Figure 5 or the "true" determinants of the cash flow distributions or of the cost of capital. We need only note that investors today cannot know for sure whether the plant under construction will be worth more or less than it cost when it is complete, and that for utilities, the range of uncertainty under traditional regulation was believed to be rather narrow, compared with that for unregulated firms.

53. The term "symmetry" has two possible interpretations: (1) the *distribution* is symmetric, that is, the shape on one side of the mean is the mirror image of that on the other side; and (2) the *payoff to investors* is symmetric, that is, the probability-weighted average of the possible values above the cost of the plant equals the probability-weighted average of the values below the cost of the plant. As drawn, Figure 5 satisfies *both* interpretations. When we intend the first sense of the term, we refer to symmetric or asymmetric *distributions* of possible payoffs. When we intend the second sense, we refer to symmetric or asymmetric *payoffs*.

54. It might at first seem more natural to think in terms of variation in earned rates of return from the cost of capital, rather than of plant values as a percentage of cost. But plant value embodies the impact of expected deviations between the earned rate of return and the cost of capital over the life of the plant. Thus, it is a more complete measure.

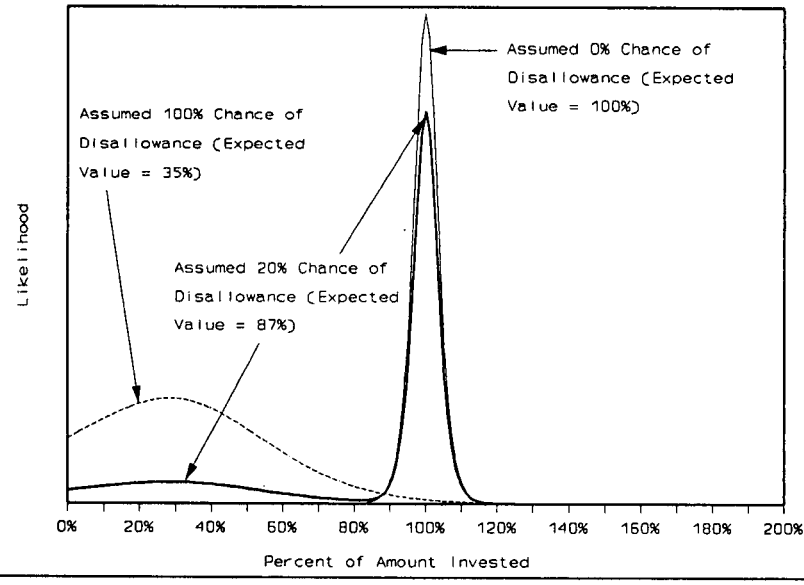
55. The distribution is drawn so the expected value of the plant, if there is a disallowance, is about 35% of its cost.

56. Figure 6 assumes that the probability distribution of disallowance possibilities is known. To employ a distinction first made by Frank Knight, this is a case of *risk*. The actual situation is more appropriately described as *uncertainty*, in Knight's terms, because investors do not know the probability distribution of disallowance possibilities. *See* F. KNIGHT, RISK, UNCERTAINTY, AND PROFIT (1921).

57. The shape of the "disallowance" distribution is purely illustrative. The value to shareholders might even be negative, if the amounts owed the plant's bondholders are greater than the value of any tax write-offs associated with the disallowance. Further, we assume the value distributions are independent of one another, that is, that knowledge of the value that this particular plant would have under traditional regulation does not provide information about the value it would have if there were a disallowance. (This is unrealistic in practice; e.g., low-cost plants would probably be exposed to smaller disallowances.) Given the independence assumption, the mean of the value distribution that assumes a 20% chance of disallowance equals the weighted average of the means of the two starting distributions: (0.8x100%) + (0.2x35%) = 87%.

Figure 6

DISTRIBUTION OF POWER PLANT VALUES UPON COMPLETION FOR A 0%, 20% AND 100% CHANCE OF A RATE BASE DISALLOWANCE



any such set of asymmetric expectations, investors would expect future cash flows to be worth less than the amount of money they initially invested.[58]

Here we define *regulatory risk* as the risk due to an asymmetric distribution of possible plant value outcomes.[59] The key economic question posed by

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58. The D.C. Circuit recognized a similar phenomenon in a proposed FCC rule that would have refunded telephone company earnings above the allowed rate of return. It stated:

> The refund rule requires the carrier to refund any earnings above the upper bound of [the allowed rate of return plus a small amount], while the carrier may not recoup any shortfall in its earnings below [the allowed rate of return] . . . . Thus, over the long run the carrier is virtually guaranteed to fall short of earning its required target rate of return . . . . [S]ince the Commission views the rate of return as a minimum [necessary return], the refund rule under the Commission's view would operate over the long run to put a carrier out of business. It should be stressed that this result does not reflect merely the business risk that a carrier is bound to accept under the accepted view that regulation does not guarantee the regulated company a profit. Rather, it is the Commission's refund rule that seems to guarantee the regulated company an economic loss.

AT&T v. FCC, 836 F.2d 1386, 1390-91 (D.C. Cir. 1988).

The situation in the telephone case can be interpreted as a truncation of the right side of the "traditional regulation" value distribution in Figure 5, similar to that which occurs for bondholders in Figure 2. This results in an expected rate of return below the promised rate of return. The D.C. Circuit overturned the proposed rule due to inconsistency with the FCC's own theory of rate of return regulation.

59. There appears to be no generally accepted definition of regulatory risk. Ahn & Thompson, *An Analysis of Some Aspects of Regulatory Risk and the Required Rate of Return for Public Utilities*, 1 J. REG. ECON. 241-57 (1989), for example, appear to define regulatory risk as the impact of regulation on the cost of capital. That is explicitly *not* our definition.

Duquesne is how investors can be appropriately compensated for such risks. Four possible answers are:

1. Increase the allowed return on investment to an amount greater than the cost of capital, by addition of a "regulatory risk premium" to restore a balanced payoff structure;[60]

2. Eliminate asymmetric payoff distributions by changing regulatory practices;

3. Add a compensating cost of service item, akin to a fee or insurance premium for provision of a risky service, to the revenue requirement; or

4. Adjust another cost recovery item by an amount sufficient to offset the asymmetry.

For the bulk of this article we will focus on the first method, the solution the Supreme Court presumed operative in *Duquesne*. It is doubtful that this presumption was specifically true for *Duquesne* and questionable that it can work in situations of considerable regulatory and other asymmetric risk. In the final section, we expand on the possibilities for other solutions.[61]

Figure 7 depicts one method of compensation for regulatory risk. In this case, investors are allowed a rate of return above the cost of capital if the plant does not experience any cost disallowance, to compensate for the risk that it might. If the regulatory risk premium is set appropriately, investors can expect that, on average, the value of the plant will equal their investment. Individual plants, however, may turn out to be worth materially more or less. We identify this case as providing a "compensated" risk of a disallowance.[62]

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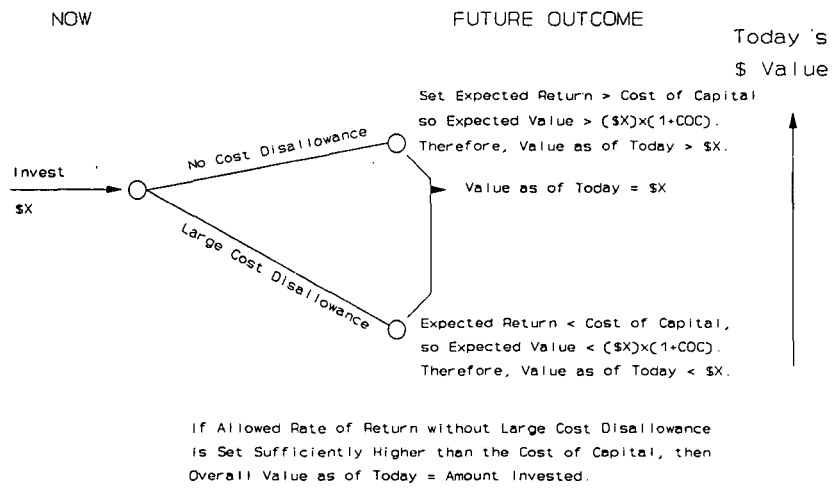
60. As noted above, promised investor returns equal the allowed rate of return times the rate base. Compensation for regulatory risk could be accomplished through an addition to the rate base. However, such a mechanism would almost surely involve a rate of return premium that subsequently would be capitalized in the rate base (e.g., a higher rate of return for the "allowance for funds used during construction"). Thus, to focus on risk compensation through a rate-of-return premium rather than a rate base adjustment is not a restrictive assumption.

61. *See* A. Kolbe & W. Tye, *The Fair Allowed Rate of Return with Regulatory Risk* (paper in progress available from the authors).

62. We refer to a "compensated" chance of a loss in the same sense as other articles address compensated transitions among rate base methodologies, *see* Myers, Kolbe, & Tye, *supra* note 10, at 111-12; *Regulation and Capital Formation in the Oil Pipeline Industry*, 23 TRANSP. J. 25, 42-43 (1984), or among regulatory treatments of deferred income taxes, *see* Kolbe, Tye, & Baker, *Conditions for Investor and Customer Indifference Among Regulatory Treatment of Deferred Income Taxes*, 15 RAND J. ECON. 434, 444-45 (1984).

Figure 7
POSSIBLE VALUES OF A REGULATED INVESTMENT
WITH COMPENSATED RISK OF A LARGE COST DISALLOWANCE



The distribution of possible plant values for a compensated 20% chance of a disallowance is illustrated in Figure 8. The "no-disallowance" distribution of Figure 6, but not the disallowance distribution, has been shifted to the right by the regulatory risk premium.[63] The distribution that assumes a 20% chance

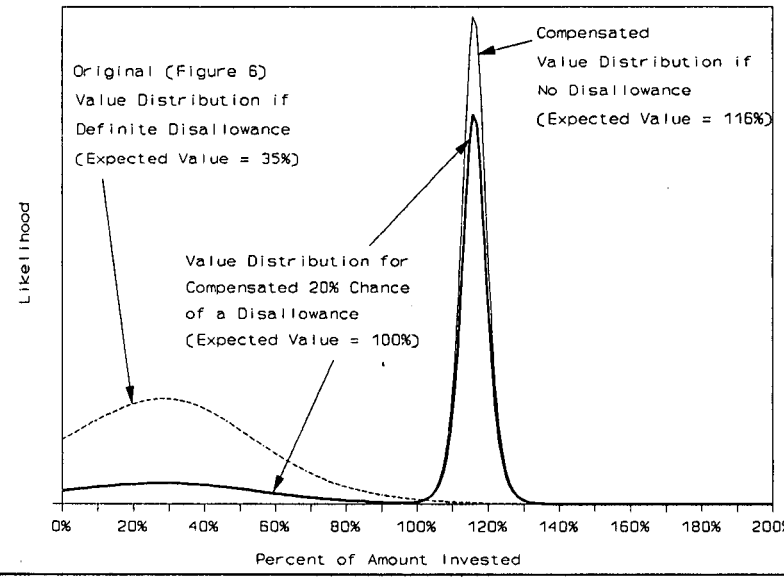
63. The regulatory risk premium proposed herein has legal precedent in decisions preceding *Duquesne*. *See* Washington Gas Light v. Baker, 188 F.2d 11, 19 (D.C. Cir.), *cert. denied*, 340 U.S. 952 (1950), where the court noted that:

> Here, the Commission adopted the prudent investment theory of rate base valuation rather than the reproduction cost method. Appraisal of the former theory reveals that the "used and useful" standard is no necessary part of it. Primary emphasis is now being placed not on specific property, tangible and intangible, but on capital prudently invested and embarked on an enterprise in the public service. Under the view taken by the Commission, the theory contemplates that rates will enable the investor to maintain his original prudent investment intact until it is recovered through annual charges to depreciation expense, which are reflected in a reserve for depreciation.
>
> * * *
>
> . . . [T]he rate of return to which the investor is entitled is measured in part by the risks of the business as compared with those of comparable enterprises. It thus becomes relevant to determine whether or not investors have, during the useful life of this property, been compensated for assuming the risk that it would become inadequate or obsolete before the investment in it was entirely recovered. Such compensation may have been made either through inclusion of obsolescence (1) as one of the elements used in calculating depreciation expense, or (2) as a risk considered in fixing the permissible rate of return. If, in the past, the risk of obsolescence was provided for in either of these two ways, then the abandoned property should not be included in the rate base today.

Id. at 19-20 (footnotes omitted).

Figure 8

DISTRIBUTION OF POWER PLANT VALUES UPON COMPLETION FOR A COMPENSATED 20% CHANCE OF A RATE BASE DISALLOWANCE



of disallowance also shifts right, such that its expected value becomes 100%.[64] Note that the odds of achieving this value on any given plant are virtually zero: once built, almost all plants either "win" or "lose" by substantial amounts. The outcome is fair (equal to 100%) only on average.

Figure 9 shows the plant value distribution for a compensated 50% chance of some disallowance. In this case, the rate of return must be set high enough that the plant's worth to investors is more than one and one-half times its cost if it is put into the rate base without any disallowance. This creates serious practical difficulties addressed later in the paper.

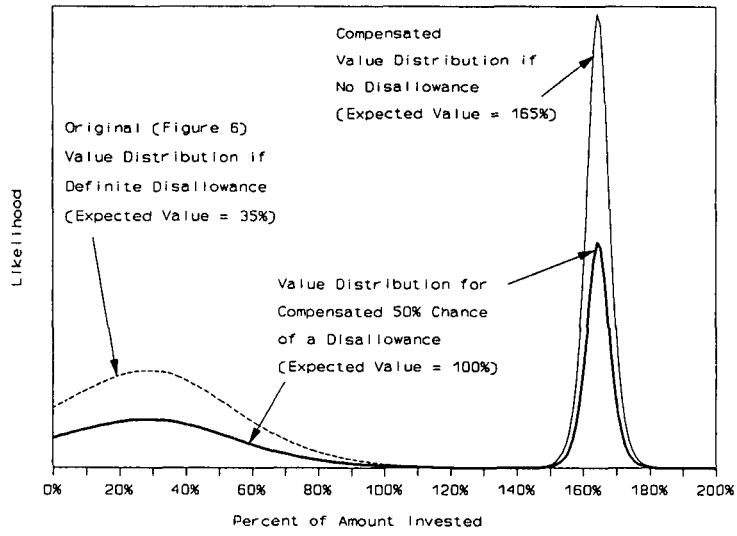
C. *Two Classes of Regulatory Risk*

To understand the economics of *Duquesne*, a final distinction must be made between two classes of regulatory risk. The first risk is that just discussed: the risk of some disallowance of the invested capital from the rate base or other event that negatively skews the distribution of returns within a consistently applied ratemaking methodology. Note that, as the Court recog-

64. Thus, Figure 6 represents both an asymmetric distribution and an asymmetric payoff to investors, while Figure 8, despite its asymmetric distribution, represents a symmetric payoff in the sense we defined *supra* at note 53.

Figure 9

DISTRIBUTION OF POWER PLANT VALUES UPON COMPLETION FOR A COMPENSATED 50% CHANCE OF A RATE BASE DISALLOWANCE



nized,[65] an adjustment to the allowed rate of return or equivalent compensation is required even in this case.

The second risk is a retroactive shift in the distribution of possible disallowances due to a change in regulatory oversight, the issue that brought *Duquesne* before the Court. This is depicted in Figure 10, which postulates that the compensated 20% loss case of Figure 8 has been in effect,[66] but that a new, more severe range of possible losses under the disallowance case is established by a regulatory rule change. Even if the no-disallowance distribution remains at the point where it provided fair compensation under the old rules, it is inadequate under the new rules: the new value distribution with a 20% chance of a disallowance has an expected value below 100% (96% in this example). Investors again lose on average.

D. *Regulatory Risk Under the Prudent Investment Rule*

Figure 5 assumes a symmetric distribution of possible future realized outcomes prior to the introduction of the risk of disallowance of prudently incurred, but unused and unuseful, investment. Comparing Figure 5 with

65. *Duquesne*, 488 U.S. at 312.
66. This is an economic interpretation of the Court's presumption in *Duquesne*.

Figure 10
DISTRIBUTION OF POWER PLANT VALUES UPON COMPLETION FOLLOWING RULE CHANGE WITH PREVIOUSLY COMPENSATED 20% CHANCE OF SOME RATE BASE DISALLOWANCE

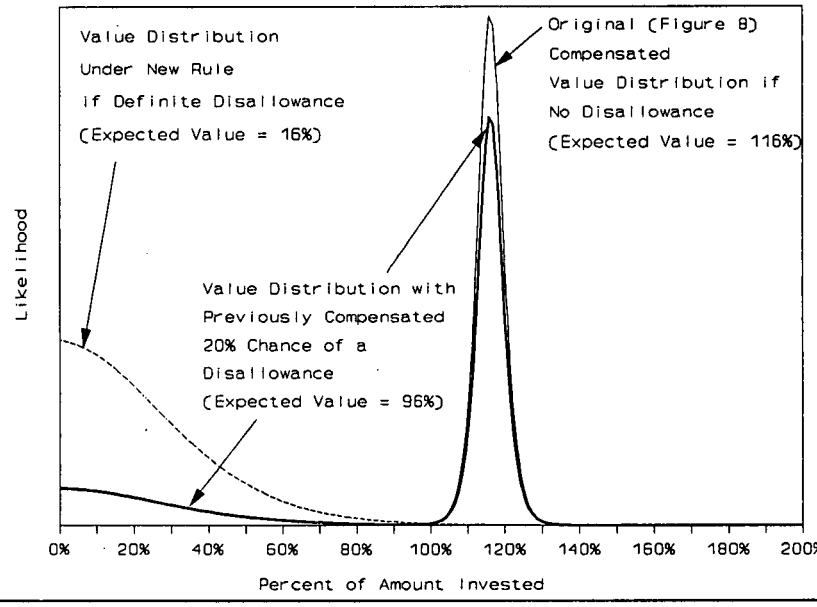


Figure 6, we see that a symmetric distribution exists under traditional regulation only if there is a zero risk of a disallowance under the pure prudent investment standard. That is, an asymmetry like the one in Figure 6 could result as well if the investment were found to be imprudent, a possibility even under the original prudent investment test.[67]

The possibility of a finding of imprudence thus questions the fundamental assumption that underlies economists' advice to equate the allowed rate of return with the cost of capital. If this assumption does not correspond to legal reality, economists have been giving bad advice.[68] As long as there is a possibility of disallowance, the economic prescription to equate the allowed rate of return with the cost of capital apparently needs to be changed even under the pure prudent investment rule.

67. Several readers of earlier drafts, including Alan Buchmann and Ernest Ellingson, have suggested the traditional rules in at least some jurisdictions included the risk of asymmetric losses.

68. Myers, *supra* note 16, speaks only of setting rates so investors expect to earn the cost of capital, not of equating the allowed rate of return to the cost of capital. However, by the time of KOLBE, READ, & HALL, *supra* note 17, it was common to assume Myers's prescription would be achieved if the allowed rate of return were equated to the cost of capital, providing that the other costs of service were estimated accurately. This Article shows that this common assumption is unrealistic.

A natural question is why investors would have supplied capital if this were the case. An answer we find persuasive is that the probability of disallowance of an unused, unuseful, or imprudent investment was perceived to be de minimis. If this is in fact the case, the interpretation of "traditional regulation" in the context of Figure 4 and Figure 5 is that the probability of—and/or the expected loss in the event of a finding of—imprudence was perceived to be so low as to be within the band of error in the estimation of the cost of capital. This fortunate result can no longer be assumed to prevail in today's regulatory climate, where asymmetry now must be confronted head on.[69] For present purposes, if we redefine "traditional regulation" to include a negligible risk of material asymmetric losses, our analysis is unchanged.

In actual situations there may be asymmetry arising from economic forces as well as regulatory actions. For example, where the firm may be subject to both regulatory and competitive constraints, the distribution may be skewed downward, and the expected return falls below the allowed return. This was the case in *Market St. Ry. Co. v. Railroad Comm'n*,[70] where the Court ruled that it was market forces rather than regulatory restraint that prevented the firm from earning its cost of capital.[71] Another example might be an environmental cleanup liability that regulators refused to pass through to customers.[72] These

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69. It is difficult to disagree with the conclusion that the degree of regulatory risk has changed substantially in the 1980s:

> When I researched this topic for other purposes in 1983, I conducted an exhaustive search for regulatory disallowances based on imprudence. The Federal Energy Regulatory Commission (FERC) and its predecessor, FPC [the Federal Power Commission], had never disallowed an investment on the basis of imprudence in the agency's fifty-year history. I could find only a few cases in which state agencies had disallowed investments based on a finding of managerial imprudence. Even in those rare cases—about one per decade—the magnitude of the disallowance was relatively trivial. The aggregate amount disallowed in the history of utility regulation probably did not exceed a few hundred million dollars. By contrast, during the period 1984 through 1988, state agencies disallowed as imprudent significant portions of the investments in nineteen completed generating plants. The average amount disallowed per plant was $610 million; the aggregate amount disallowed was $11.6 billion. If these agency findings are to be believed—that is, if the findings of the past four years are something other than a guise for politically opportunistic exercises of raw political power to redistribute wealth from a minority to the majority—then they suggest a startling trend in the industry's management. Apparently, for decades electric utility managers were almost uniformly individuals with outstanding business acumen. At some point in the 1980s, this entire generation of exceptional managers was replaced en masse by a generation of bumbling idiots.

Pierce, *Public Utility Regulatory Takings: Should the Judiciary Attempt to Police the Political Institutions?* 77 GEO. L.J. 2031, 2050-51 (1989) (footnotes omitted).

One is reminded of Mark Twain's surprise that his father, having been an ignoramus at Twain's age of 14, could have learned so much in the 7 years it took Twain to become 21.

70. 324 U.S. 548 (1945).

71. *Id.* at 566-67.

72. See Hogan & Kolbe, *How Far Back Should Prudence Tests Reach?* PUB. UTIL. FORT., Jan. 15, 1991, at 34-37, for a discussion of proposals to disallow potentially hundreds of millions of dollars of environmental cleanup costs in a generic proceeding before the Massachusetts Department of Public Utilities. The risk exposure represented a large share of the net worth of the local gas distribution companies in the Commonwealth.

situations would need to be corrected by a mechanism similar to that proposed here for regulatory risk of disallowance of unused and unuseful investments.

E. *What Type of Rate of Return on Equity Is Typically Allowed by Regulators?*

To this point we have implicitly assumed that regulators ordinarily equate the allowed rate of return under the old prudent investment rule with the *expected* rate of return on equity, not with the equivalent of a *promised* rate of return on equity as defined in the bond example. The basis of our assumption is the definition of the cost of capital given above: the *expected* rate of return in capital markets on alternative investments of equivalent risk.[73] The term "expected" in this definition is precisely the same as that defined in the junk bond analogy. Indeed, the cost of capital of a junk bond *is* its expected rate of return, not the promised yield to maturity that is ordinarily quoted.[74]

Nonetheless, when regulators set the allowed rate of return on debt, they use the promised interest rate, which produces the promised yield at the time the debt is issued, not the expected rate.[75] No reduction in the promised amount is made to account for the fact that bondholders expect somewhat less because the firm may someday default on its debt. There are at least two good reasons for this. First, the promised rate on debt is all that can be directly observed; calculation of the rate bondholders expect would be difficult at best. Second, bondholders are treated fairly only if they are paid the full promised rate (13.5% in the above example) absent default. If they were paid only the expected rate (11.3%) without default so that 11.3% became the upper limit, the true rate they would expect, given the risk of default, would fall well below 11.3%; bondholders would be shortchanged.

The expected and promised rates on bonds differ only because of the asymmetric distribution (in the first sense of the term defined above) of bond payoffs. Regulatory rules that create asymmetric distributions for investors can make the expected and "promised" rates of return differ for equity as well. Unlike debt, however, *the "observed" rate of return for equity is its expected rate of return, not the equivalent of a promised rate of return.*[76] Yet in the

73. *See* text accompanying *supra* note 16.

74. BREALEY & MYERS, *supra* note 17, at 561-62.

75. Regulation typically allows a rate of return on the debt share of the rate base equal to the embedded interest rate on outstanding debt.

76. There are a variety of methods to estimate the cost of equity capital, but all aim at the expected rate of return. *See* KOLBE, READ, & HALL, *supra* note 16, ch. 3. The intuitive way to see this may be to suppose the rate of return analyst in a particular case had a perfect sample, a group of utilities that had already had past disallowances and still were at risk of having future disallowances with the exact frequency distribution facing the utility in the above examples. Then, any commonly used method of estimating the cost of equity capital, whether based on a backward look at history or a forward looking interpretation of current stock market evidence, would measure the *expected* rate of return for the sample, which would

presence of an asymmetric distribution, regulators must allow the equivalent of a promised rate of return on equity if investors are to have a fair chance to earn the expected rate of return as measured by testifying experts.[77]

III. Economic Implications of *Duquesne*

The previous section leads immediately to an economic interpretation of the Court's view of the situation in *Duquesne*.

As a rule, the computation of the allowed rate of return must be consistent with the regulatory risks inherent in the regulatory system used. In the Court's view, Duquesne Light's investors were subject to a regulatory system something akin to that depicted by Figure 8 or 9, with an allowed rate of return that compensated them for the risk of a lost return *on* (but not *of*) capital should the CAPCO plants turn out not to be used and useful.[78] The Court suggests that regulatory systems that do not compensate for the regulatory risks inherent in that system might violate the Constitution,[79] but the used and useful standard, at least, does not do so intrinsically in and of itself.[80]

After the adverse outcome was known, the Pennsylvania legislature imposed a full used and useful test that denied investors the return of capital as well. The Court held that this is not inherently a taking of property,[81] if offset by other factors,[82] but can raise "serious constitutional questions" otherwise.[83]

The opinion cites no evidence of other offsetting factors, so the result is a situation like that in Figure 10 which imposed a windfall loss on Duquesne Light's investors. If the switch had been severe enough, the new expected rate of return after the switch would have fallen outside the normal range of varia-

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be the expected rate of return for the company in question as well. For example, in Figures 8 or 9, a drawing of a large sample of firms facing either figure's distribution of returns would produce a rate of return consistent with the expected value, not the "promised" (i.e., *allowed*) rate of return on plants that suffered no disallowance.

77. To prevent misunderstanding, we will note that we are *not* recommending a guaranteed rate of return on equity in the absence of a disallowance. The equivalent of a "promised" rate of return on equity is merely a rate of return equal to the cost of equity capital plus a premium for the risk of a disallowance, just as the promised rate of return on a corporate bond equals the cost of capital for the bond plus a default premium. Utilities would no more be guaranteed to earn that rate of return in the absence of a disallowance than they are when the allowed rate of return equals the cost of capital in the absence of a disallowance.

78. *Duquesne*, 488 U.S. at 310-12.

79. *Id.* at 315.

80. *Id.* at 301-02.

81. *Id.*

82. *Id.* at 310.

83. *Id.* at 315.

tion of regulatory outcomes,[84] and according to the Court's analysis, issues of unconstitutional taking would exist.[85]

But despite the apparent lack of other offsetting factors, the loss as measured by the Court was so slight as to fall within the normal range of variation of approved regulatory outcomes. Therefore, constitutional taking issues did not arise.[86]

The implication is that the Court found no constitutional distinction between a bad outcome realized under a system where good outcomes balance bad ones on average, and a rule change that always imposes a certain loss, without any offsetting chance for a gain, as long as the loss is "slight." If an adverse, retroactive switch in ratemaking methodology produces a capital loss that conceivably could have occurred in the prior regulatory regime, the end result will be found constitutional under this test. Rational investors, however, will recognize the difference between a random event that could happen in a fair game and the results of a biased game in which adverse changes are intentionally imposed. This recognition leads to the problem of how to compensate investors for this risk.

In this section, we show that these findings create a regulatory system that may prove difficult or impossible to implement fairly. First we discuss measurement problems for attempts to arrive at a fair promised rate of return on equity. Then we show that the very need to use a promised rate of return makes that rate of return even harder to determine fairly. Finally, we show that the Court's definition of slight is biased downward, which makes these problems still more severe in practice.

A. *Measurement Problems for the Allowed Rate of Return under Asymmetric Regulation*

Regardless of what has been true historically, *Duquesne* makes clear that certain rate base methodologies, consistently applied, have regulatory risks for which investors must be compensated in the allowed rate of return. The Court's own ranking of the risks inherent in the alternative rate base/rate of return standards demonstrates that recognition of the regulatory risk inherent in the modified prudent investment and used and useful standards is required.

The opinion therefore requires the development of improved procedures for incorporating regulatory risk into rate base/rate of return methodologies. We need to find ways to infer the equivalent of a promised rate of return on

84. We presume this means outside the narrow, symmetric band of possible realized outcomes depicted within the traditional regulation curves in Figure 5, but we raise this question again later.

85. *Duquesne*, 488 U.S. at 314-15.

86. *Id.* at 312.

equity in order to give investors a fair opportunity to earn the expected rate of return on equity calculated with the standard methods.[87]

Unfortunately, it is difficult to imagine how this can be done rigorously. Unlike debt, equity contains no well-defined claim on a set of promised cash flows that, with the addition of the original amount paid for the security, would permit computation of a promised yield to maturity on equity. The figures above simply assume we know the distribution of values investors expect under a disallowance case to illustrate the principles. The data necessary to construct such figures in an actual case are almost certain to be difficult to identify.

Despite this fact, *Duquesne* teaches that regulated firms which make investments in jurisdictions with rules that produce asymmetric distributions of outcomes now need a regulatory risk premium over and above the estimated cost of equity capital.

B. *Calculation of a Regulatory Risk Premium*

Given the absence of data, some commissions may simply choose to add a risk premium without detailed analysis. There is no way to tell if such a premium is truly compensatory, however. A more careful approach would be to make an explicit assessment of the expected loss if there is an event with an asymmetric effect and of the likelihood that such an event will occur. Given estimates of such losses, how should a commission that wants to make an explicit assessment proceed?

The answer depends in part on how the regulatory risk premium is to be implemented. As an example, we consider the possibility that a plant under construction will be later declared unused and not useful. The most direct approach would be to add a premium to the allowance for funds used during construction (AFUDC) rate.[88] The premium will be capitalized with the rest of AFUDC if the plant goes into the rate base, thereby providing a fair promised return for the risk during construction.

The fair promised AFUDC rate for a given year could be derived with the following logic. Construction amounts expended by the start of the year, including past accrued AFUDC, need to have an expected value equal to the initial amount plus the return on capital at the end of the year.[89] The expected

87. See KOLBE, READ, & HALL, *supra* note 17, chs. 3-4, for discussion of these standard methods.

88. Under AFUDC, interest and return on equity for construction in progress is accrued and capitalized during the construction period, but no cash payments are made by ratepayers until the construction is completed. Unless recovery is denied, the investment plus accrued AFUDC goes into the rate base at that time. An alternative to adding a risk premium to the rate of return on AFUDC would be to allow a premium in the rate of return on total assets currently in service. This would avoid some of the difficulties discussed below with an AFUDC premium, but would seem contrary to the spirit of a used and useful statute. Moreover, this alternative would not be feasible for a stand-alone project.

89. Amounts spent during the year can be treated exactly the same way, but with rates of return prorated for the partial year.

value is a weighted average of the promised return times the probability that the plant is still on track at the end of the year plus the disallowance return times the probability the plant has been abandoned. Mathematically, this is as follows:[90]

$$K_0x(1+coc) = K_0x(1+aror)x(1-Pr_d) + K_0x(1+disr)xPr_d \quad (1)$$

where

K_0 = the cumulative capital outlays as of the start of the year, including previous AFUDC;

coc = the cost of capital;

aror = the allowed (i.e., the promised) rate of return used for AFUDC;

Pr_d = the probability that an event triggering the disallowance return will occur over the next year; and

disr = the disallowance return, which is usually negative.[91]

Equation (1) can be solved for the fair allowed rate of return for AFUDC:[92]

$$aror = \{[(1+coc) - (1+disr)xPr_d]/(1-Pr_d)\} - 1 \quad (2)$$

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90. With appropriately defined variables, Equation (1) and those that follow could be used either with the overall rate base and allowed rate of return or with the equity rate base and the allowed rate of return on equity.

91. We are indebted to Nancy Lo for pointing out that Equation (1) as specified combines the allowed rate of return in the event of a disallowance and the percentage magnitude of the disallowance into a single term (disr). A somewhat different formula would result if these two components of disr were shown as separate terms. In actual applications, there may be times when it is more convenient to separate these two terms.

92. If it were more convenient to separate term disr in Equation (1) into disr = [disr*, the (negative) magnitude of the disallowance, + (aror, the allowed rate of return, x disr*)], if the allowed rate of return on the approved rate base were the same regardless of whether a disallowance occurred, Equation (2) would be given instead by

$$aror = \{(1+coc)/[1+(Pr_d)x(disr^*)]\} - 1 \quad (2^*)$$

In any actual application, it would be important to keep track of the distinction between disr*, the magnitude of the disallowance itself, and disr, the overall rate of return on the initial investment, K_0, in the event of a disallowance.

For example, suppose a commission believes that there is a 10% chance of plant abandonment during the next year and that the company's cost of equity capital is 15%. Suppose the company is on a pure used and useful system, and that if the plant is abandoned shareholders lose their entire investment.[93] Under this procedure, disr = -1 because investors lose 100% of their investment to date, and the formula for the fair AFUDC rate is

$$\begin{aligned} \text{aror} &= \{[(1+0.15) - (1-1)x0.1]/(1-0.1)\} - 1 \\ &= (1.15/0.9) - 1 \\ &= 27.8\% \end{aligned}$$

Suppose instead the company had been on the modified prudent investment standard and got back payments with a present value of 50 cents on the dollar in the event abandonment occurred, so disr = -0.5. Then the fair allowed AFUDC rate would be

$$\begin{aligned} \text{aror} &= \{[(1+0.15) - (1-0.5)x0.1]/(1-0.1)\} - 1 \\ &= [(1.15-0.05)/0.9] - 1 \\ &= 22.2\% \end{aligned}$$

Thus, the Court's finding that the used and useful standard represents greater risk than the modified prudent investment standard is borne out by the simple economics of the fair rate of return. What may be surprising is the size of the regulatory risk premium required under the modified prudent investment standard. This regulatory risk premium is 7.2% (aror - coc = 22.2%-15.0%), with only a 10% abandonment risk and 50% loss of capital given abandonment.[94] Table 1 shows the fair allowed AFUDC rates under a variety of disallowance probabilities and returns.[95] In practice, the high probabilities

93. The actual shareholder loss is uncertain. Plant abandonments may generate tax benefits even under a pure used and useful rule. These benefits might in principle be passed through to ratepayers, leaving shareholders with no tax benefit. It seems more likely, however, that the saved income due to the tax deductions would be left to investors on the ground that the tax losses correspond to assets that are not used and useful. The present value of future tax benefits then would partially offset the loss. However, bondholders would still have to be repaid by shareholders out of other income, if the plant was not a stand-alone venture. Thus, shareholders might end up losing more or less than the amount of their original investment.

94. Again, this -50% is the value of disr, not disr*. *See* text accompanying *supra* note 92. If the assumptions of the example were changed so that the -50% were the loss in K_0 and the allowed rate of return were granted despite this loss, a less severe penalty than assumed in the text, Equation (2*) would be relevant. In this case, aror = 21.1%, which still represents a 6.1% regulatory risk premium.

95. If the potential loss does not affect the size of the rate base—for example, if the loss is an unrecoverable environmental cleanup expense—a formula different from either Equation (2) or (2*) holds. If L is the size of the potential loss, K is the rate base, coc the cost of capital, aror the allowed rate of return, and Pr the probability of a loss, the analogue of equation (1) that defines the fairness requirement is [K x (1 + coc)] = [K x (1 + aror)] - (Pr x L). This implies that the analogue of equation (2) is aror = coc + [(L/K) x Pr]. The fact that the rate base is not at risk reduces the size of the fair allowed rate of return, but the magnitude can still be far above rates of return normally allowed in rate cases. If there is a 50-50 chance of a loss equal to 50 percent of the rate base, for example, the fair allowed rate of return

of abandonment may be quite realistic. Even if the risk of abandonment were quite low in early years for plants that have actually been abandoned, for example, in later years they must have gotten quite high (approaching 100% at the end).

Table 1

FAIR ALLOWED RATE OF RETURN WITH CHANCE OF FULL OR PARTIAL DISALLOWANCE OVER THE NEXT YEAR
(Percent)

Probability of a Disallowance (%)	Rate of Return Given a Disallowance			
	-25 %	-50 %	-75 %	-100 %
0	15.0	15.0	15.0	15.0
1	15.4	15.7	15.9	16.2
5	17.1	18.4	19.7	21.1
10	19.4	22.2	25.0	27.8
25	28.3	36.7	45.0	53.3
50	55.0	80.0	105.0	130.0
75	135.0	210.0	285.0	360.0

Assumptions: 1) The probability of a disallowance is independent of the fair allowed rate of return.
2) The cost of capital is 15%.

We do not know if the PUC allowed a regulatory risk premium of the above magnitudes in the AFUDC rate for the CAPCO plants, but our experience suggests this is extremely unlikely.[96] In that case, the Court's presumption that the allowed rate of return included compensation for the probability of abandonment must rest instead on the presumption that the overall allowed

exceeds the cost of capital by 25 percentage points (that is, a 15 percent cost of capital becomes a 40 percent fair allowed rate of return).

96. A factor raising doubt that such was the case is the fact that Pennsylvania switched back to the modified prudent investment standard for all investments canceled after 1985. A cynical interpretation of this provision is that it was an effort to impose a retroactive switch on old investments without having to pay an additional regulatory risk premium on future investments under the used and useful test. While Charlie Brown may believe that Lucy will not snatch away the football yet another time in the comic strip, investors may well be skeptical of attempts to switch methodologies only for sunk investments.

rate of return on all of Duquesne Light's assets was set sufficiently above the cost of capital. The required premium in the rate of return on all assets would be smaller than that on the CAPCO assets alone, since it would be a weighted average of a (relatively large) premium on the CAPCO assets and no premium on the rest of the assets.[97] For example, since the CAPCO assets represented about 2% of Duquesne Light's rate base, a 50% regulatory risk premium on CAPCO[98] would require a 1 percentage point premium in Duquesne's *overall* rate of return.[99] The Court's presumption enabled it to avoid an investigation of whether such a premium in fact existed.

C. *Interaction Between the Regulatory Risk Premium and the Probability of Disallowance*

If the probability of noncompletion is an objective number, the necessary adjustment is very simple. However, in practice, estimation of such a probability will be difficult. First, there is likely to be no objective, actual experience that would permit the determination of a consensus forecast for the probability of disallowance in a particular application. The assumed disallowance distribution in Figure 6 will vary greatly across investments and regulatory jurisdictions, and is likely to be the object of great dispute in every rate case.

Furthermore, the examples in Table 1 show that the necessary allowed AFUDC rate could approach politically unacceptable levels in even relatively low-risk situations. What's more, the addition of a premium for plants under construction to the overall allowed rate of return would carry its own set of legal or political problems. For example, it might be argued that such a remedy represents a violation of a used and useful statute.

Moreover, the risk of abandonment may not be independent of the allowed rate of return. During long lead times, the risk of abandonment may increase, necessitating increases in the cost of attracting more capital. This increases the cost of the project, leading to an even greater probability of abandonment. The system simply may not converge to a stable equilibrium with a politically acceptable rate of return and an economically viable probability of completion.

A policy of disallowance of unused and unuseful investments may also create perverse incentives for abandonment and continuation for ratepayers and investors. Investors may want to complete plants more socially rational to

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97. This assumes the CAPCO plants in question were the only plants at risk of abandonment. If other plants under construction were also at risk, the required premium would be higher than calculated here.

98. Table 1 suggests a 50% premium is not an an unreasonable figure during the last years of a troubled plant.

99. Since Duquesne Light's common equity-holders bear the loss, the risk premium should inure to their benefit. Duquesne Light's common equity ratio near the end of the CAPCO plants' abandonment was about 35%, so the regulatory risk premium on equity under these assumptions would be 1%/0.35, or almost 3%. *See* text accompanying *infra* note 111.

abandon, and ratepayers may want to abandon plants more socially rational to complete.

Given all of these circumstances, the Court's presumption that the allowed rate of return can be set to compensate for the regulatory risk may be faulty, particularly where the plant at risk represents a large share of the total rate base: there may be *no* feasible fair allowed rate of return.[100] If rate base/rate of return regulation is to be preserved in this case the only remedy is to restore symmetry to the regulatory rules.

D. *Moral Hazard*

The odds of adverse rulings from events such as plant abandonment are not given solely by exogenous, economic factors, but rather depend in part upon decisions of regulators themselves. The problem created is similar to one sometimes encountered in the insurance industry. When the party who benefits if an insurable risk occurs (the policyholder) is able to change the amount to be paid or the likelihood that payment will occur, "moral hazard" is said to exist. Establishing a fair insurance premium in the presence of moral hazard is difficult or impossible.[101]

The problem of moral hazard may be illustrated by a somewhat whimsical example. Suppose a world famous gunfighter invites a tenderfoot to a poker game, but reserves the right to pull out his gun and change the rules at any time. What up-front risk premium does the tenderfoot require if he is to join the game?

If the risk premium itself is not subject to expropriation via a later change in the rules, the required premium is the tenderfoot's maximum loss, all that he brings to the table. This is the only answer because the tenderfoot realizes the gunfighter can claim everything he brings to the table at any time.

Further, the gunfighter must at some point expropriate an amount equal to the risk premium to make the game fair: the gunfighter has already paid that amount to the tenderfoot as compensation for the right to change the rules. In this case the outcome is determinate: the risk premium is equal to the assets

100. The situation is analogous to the practice in which a new junk bond contains a promise to adjust the interest rate so it trades at face value at a fixed future date. If the company is in enough trouble, raising the promised interest rate reduces the odds the promise will be kept, which requires a further increase in the interest rate, and so on. Western Union reportedly had a bond issue that it was unable to make trade at face value for this very reason. *See Bonds with Resettable Interest Rates Face Major Test with Western Union Note Issue*, Wall St. J., May 2, 1989, at C2, col. 3; *Bond Price Softness May Persist as Investors Focus on Inflation*, Wall St. J., June 19, 1989, at C17, col. 2.

101. Here we assume that there is no difference in the information available to the utility and the regulator, or at least that any differential information is swamped in importance by the true uncertainty about how much the plant will cost on completion and whether electric demand will have grown by an amount large enough to require the new capacity. We consider only the problem created by the fact that the regulatory body, which has paid for insurance, is the party that makes the decision as to whether the insured event has occurred.

that the tenderfoot brings to the game, which are at some point seized by the gunfighter. (They may play a while first for the fun of it.)

If the risk premium itself is also subject to seizure during the game (that is, if the amount of the potential loss is also under the control of the gunfighter), there is no risk premium great enough to induce the tenderfoot to play because the tenderfoot can never hope to do anything but lose all assets brought to the table.[102] The game never takes place.

We do not intend to imply that regulators are amoral gunfighters who are eager to change the rules in unfair ways to benefit ratepayers at investors' expense. The hypothetical example only illustrates the serious problem that the power to change the amount of the loss or to change the rules retroactively (now conferred by the Court for slight losses) creates for calculation of an *ex ante* fair risk premium. And without a fair *ex ante* risk premium, to return to the earlier metaphor, the tenderfoot will not play (or at least will stop bringing new amounts to the game).[103] Thus, exercising the freedom granted by the Court in *Duquesne* will eventually force regulators to face the problem of an appropriate regulatory risk premium.

Yet explicit recognition of regulatory risk with payments of premia for the right to change the rules can impose destabilizing incentives as well. Unless regulators perceive meaningful costs of regulatory change and voluntarily refrain from changing the rules, *and unless investors believe they will refrain*,[104] the prospect of perhaps limitless[105] regulatory risk to investors forecloses the game entirely. But naming that risk and explicitly compensating for it may make regulatory change inevitable, if only because regulators may feel bound to exercise the right once ratepayers have paid for it.[106]

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102. Note that this is analogous to embodying the regulatory risk premium in the AFUDC rate: if the plant never goes into rate base, the risk premium never has to be paid. Yet as noted above, granting the risk premium in cash seems contrary to the spirit of a used and useful rule. We see no ready way around this difficulty.

103. If the gunfighter joins the game in midstream, the tenderfoot will already have cash on the table. The gunfighter may be able to force the tenderfoot to contribute new amounts of cash by a threat, implicit or explicit, to expropriate what is already in the game. But sooner or later the tenderfoot is better off forfeiting what is already on the table than contributing anything new.

104. The problem is even worse: under *Duquesne*, today's regulators cannot completely bind future regulators, so investors have to believe current *and future* regulators will refrain from destabilizing changes.

105. The Court limited risks from rule changes to losses it found to be slight. But as shown next, the losses were larger than it recognized. Moreover, it did not expressly limit the number of rule changes that impose such slight losses.

106. To return to the junk bond analogy, this is equivalent to regulators' forcing a utility to default on its debt *because* ratepayers have paid a default premium in the interest rate. Such a policy would rapidly close the market for new debt to that company. Kaplow, *An Economic Analysis of Legal Transitions*, 99 HARV. L. REV. 509 (1986), argues that there is a "close kinship between uncertainty regarding government policy and market uncertainty" and thus, "as an initial hypothesis governmental transitions warrant the same treatment as market transitions: no transitional relief." *Id.* at 513. Whatever validity these conclusions may have for unregulated industries, this article has identified clear moral hazard problems for regulated industries.

Thus, the *Duquesne* opinion creates a difficult problem for regulators and investors alike.

E. *Definition of "Slight"*

The final issue concerning retroactive changes in rate base methodology involves the measurement of "slight." The Court recognized that an uncompensated retroactive switch from the modified prudent investment standard to the used and useful standard unambiguously imposed real losses on investors. However, within an imprecisely defined limit of constitutional magnitude these losses can legally be imposed.

In stating that it had reaffirmed both *Hope* and the Pennsylvania decision, the Court obviously believed that the problem of compensating investors for exposure to regulatory risks arising from switches in methodology could be confined to reasonable levels and assumed to be slight in most cases.

The economic foundations of this belief are questionable at three levels. First, it is not clear at what level constitutional magnitude ought to be measured. The Court stated that the canceled plants involved a $35 million investment for Duquesne, or 1.9% of its total rate base. Yet "more than 100 nuclear power plants worth $30 billion have been abandoned in recent years."[107] The Court's decision to examine the definition of "slight" on a company-specific basis leaves open the cumulative impact industry-wide. For example, given that cases are often settled without ultimate legal rulings, the *Duquesne* opinion may influence future settlements of disputed regulatory rules in a way that amounts to a large cumulative loss for the nation's regulated investors without an offsetting chance for a gain, even if the losses to Duquesne Light were indeed slight.

Second, the Court did not limit the number of "slight" losses that could be imposed. Many small losses could add up to a large one in a hurry, especially given the third problem.

The third difficulty is that the actual losses were larger than the Court recognized. The Court, undoubtedly relying on the evidence before it, based its decision on the figures cited at the outset of this article: the loss was a 1.9% reduction of its $1.8 billion rate base and a 0.4 percentage point reduction in Duquesne Light's annual allowed rate of return.[108] Both measures are flawed.

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107. Greenhouse, *High Court Rejects Charges by Utilities for Unused Plants*, N.Y. Times, Jan. 12, 1989, at A1, col. 1.

108. Earlier we assumed the Court's test referred to outcomes under traditional, symmetric regulation. The logic of the Court's reasoning might instead have called for a comparison of the end result of the switch with the range of possible variation of the prior ratemaking methodology. In *Duquesne* this would have been the modified prudent investment standard, not the prudent investment standard. Thus, it is not quite clear whether the task should be with the range of any acceptable methodology, against the prior methodology, or against the least risky methodology. Figures 8 and 9 illustrate that the window of constitutional magnitude could be extremely large if it is defined in terms of possible outcomes under

The rate base represents the assets backed by debt, preferred equity, and common equity. But common shareholders bear the loss: the bondholders and preferred shareholders expect to be paid out of Duquesne Light's general revenues regardless of the regulatory treatment of the CAPCO investment.[109] Thus, the more appropriate test is the loss as a fraction of the *common equity* rate base. *Value Line* reported that Duquesne's common equity ratio was 34.5% in 1981 and 36.8% in 1982.[110] If we take the latter figure, the loss was 5.3% [$35 million/($1,800 million x 0.367)] of the amount put up by those who actually bore the loss, nearly three times the proportion recognized by the Court.[111]

The other measure used by the Court also has economic infirmities. The loss affected not just the first year's rates, but rates for as long as the amortization of the CAPCO plants' cost would have been authorized by the PUC's initial ruling. If the loss is to be calculated as the decrease in a single year's rate, the present value of the future lost amounts should be calculated and treated as the loss for that year.[112] That procedure, if implemented correctly, would at least provide an economically valid measure of the loss at issue in the case.[113]

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extremely risky prior ratemaking methodologies. Or perhaps "slight" must be measured as a comparison between the expected values under the old and new rules. Another interpretation is that it is defined in terms of the range of error in estimation of the cost of capital in the prior ratemaking methodology. These problems will obviously have to be addressed in any future cases involving the definition of constitutional magnitude.

109. This statement embodies the assumption that either the debt used to finance Duquesne's CAPCO investment was not backed solely by the CAPCO assets, or if it were, that Duquesne would find it more expensive to default on this debt (because of higher cost for future debt) than to redeem it. We believe the first assumption is quite likely; there certainly is no evidence in the opinion or the briefs of the parties to the contrary.

110. VALUE LINE, INVESTMENT SURVEY (June 23, 1989).

111. Recall the theorem, *supra* note 49, that rate base equals value to investors if the expected rate of return equals the cost of capital. If that condition were satisfied despite the rule changes in process, the $35 million loss in rate base would measure the lost value to investors between the pure prudent investment standard and the used and useful standard. If the Court is correct that Duquesne Light was on a compensated version of the modified prudent investment standard, the loss would equal the present value of the return of capital authorized in the original PUC decision. That would be less than the loss in the rate base if the conditions of the theorem were otherwise satisfied under those rules.

In regard to this general point, we are indebted to Judge Stephen Williams for his comment that a disallowance may cause the market value of debt to fall, somewhat ameliorating the loss to equity holders. This effect would be minimal in the circumstances of *Duquesne*.

112. An analogy to the bias that results from looking at only one year's lost return is as follows. Suppose a customer adds $1,000 to a $10,000 floating-rate certificate of deposit. The customer knows there is a range of possible interest rates that he or she might earn. Following the reasoning of *Duquesne*, one might conclude that after the customer has added the money, it is constitutionally acceptable for the bank to change the rules to take the new $1,000 as a previously unmentioned fee, as long as the unexpected loss doesn't result in a rate of return lower than what the customer might have ended up with under the original rules. And when the Court measures the loss, it looks not at the amount taken, $1,000, but only at the first year's lost interest on that amount, say $80. That lost interest is a small fraction of the amount deposited ($80/$11,000 = 0.7%), well within the range of uncertainty in interest rates, so the Court's ruling is that the taking does not reach constitutional magnitude.

113. A switch from modified prudent investment to the used and useful test imposes additional risks to investors that cannot automatically be deemed slight. For example, compare the additional risk premia

Thus, if *Duquesne*'s method of calculating the loss is taken by courts and regulators as precedent, rather large property takings may be dismissed as of less than constitutional magnitude. If this is the case, *Duquesne* may not turn out to be the reaffirmation of the *Hope* standards that the Court apparently intended. This is true both because of the Court's definition of slight and because it is a much harder task to compensate investors for the risks they bear as a result of possible adverse changes in the rules of the game than it is to compensate them for the risks inherent in a consistent application of the initial rules.

F. *Objections to the Above Line of Reasoning*

Since our initial draft of this paper, we have received a number of comments that pose objections to our analysis. There appear to be two main lines of criticism, each with its own set of points. Our full response to these points is the subject of a second paper,[114] still in draft as this goes to press, but it seems useful to sketch the issues and our answers here.

The first main line of criticism posits that regulation has always included the kind of asymmetric risk we describe in this article; therefore, our characterizations of the problems we describe are either overblown or already accommodated by existing regulatory practices. Note that this argument accepts our reasoning and differs only on whether asymmetric regulatory risk is a new and serious problem or an issue long solved.[115]

The second main line of criticism is that our logic is faulty and the problems we describe do not really exist. There are many variants to this argument, which sometimes are mutually inconsistent.

The basic point in the first line of criticism is that what we have called traditional regulation already incorporates asymmetry, contrary to the assumptions reflected in Figure 5. If so, our critics state, recent disallowances do not signal a shift in the distribution; rather, the distribution has *always* been similar to what is shown in Figure 6. Such a distribution reflects the fact that, since the promulgation of the prudent investment test in *Hope*, there has always been a probability of disallowance for imprudent investment. The events of the 1980s, addressed in part in *Duquesne*, are only the realization of a large but relatively unlikely loss. Investors knew of the risk of this outcome and were compensated for bearing that risk. Therefore, the disallowance of the cost of the aborted plants is not a constitutional taking.

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required when going from, say, a 50% to a 100% loss in Table 1.

114. *See* Kolbe & Tye, *supra* note 61.

115. This is significant because ratepayer interests have emphatically denied the need for a regulatory risk premium.

Our response to this point is that first, the problems with regulatory asymmetry arise regardless of whether there has been a shift in the distribution. As explicitly recognized by the Court in *Duquesne*,[116] if an asymmetric distribution of the sort depicted in Figure 6 exists, some compensating adjustment of the sort depicted in Figure 8 is required if investors are to have a fair opportunity to earn the cost of capital. The simple logic of Figure 4 shows that investors *cannot* receive such a compensating adjustment if regulators have successfully set rates so that investors expect to earn only the cost of capital in the no-disallowance outcome.[117]

Second, the issue then becomes one of materiality. The study by Richard Pierce[118] and our own experience with the electric industry convinces us that a shift in the distribution of possible outcomes *has* occurred, and that the problem became material in the 1980s. Thus, the fact that investors supplied capital to the electric industry for decades before the 1980s is not evidence that the problem is de minimis.

Nor is the fact that utilities were able to raise new capital during the 1980s evidence that the problem is not material. It is always possible to raise new capital for new investments if valuable claims on existing assets are thrown in with the purchase, as happens when new shares are sold at prices far below the value per share of the equity rate base.[119]

Thus, we conclude in response to the first line of criticism that the problem not only exists, but is material and must be faced.

The second line of criticism challenges our logic. Typical of this line are four objections:

1. Explicit accounting for regulatory and other asymmetric risk would shield investors in regulated industries from the risks common to unregulated industries.

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116. *Duquesne*, 488 U.S. at 310-12.

117. This was recognized by the D.C. Circuit in AT&T v. FCC, 836 F.2d 1386 (D.C. Cir., 1988). See *supra*, note 58.

118. Pierce, *supra* note 68.

119. Recall the theorem discussed at *supra* note 49. A related objection is that in many circumstances, new investors have bought stock at prices depressed by the increase in regulatory risk. Given the low price, would it not be wrong, our critics ask, to compensate the new investors for the risk via a policy that increased the allowed rate of return? In other words, would not the sudden jump in stock price from such a policy be an undeserved windfall?

There are essentially two responses. First, a "windfall" for new investors simply restores long-time investors to the status quo ante; what is "unfair" for one group just restores fair treatment for others. Second, and far more important in the long run, capital will be supplied only if the investments made with the capital are worth at least what they cost. New capital can be raised in the short run at market-to-rate base stock ratios below 1.0 because the new investors get claims on assets bought with old investors' money. In the long run, however, investors will refuse to contribute new capital under such rules. The optimal strategy in such cases is to minimize the capital subject to regulatory risk.

2. The Discounted Cash Flow (DCF) method of measuring the cost of capital incorporates all risks, including regulatory risks.

3. The Capital Asset Pricing Model (CAPM) denies that diversifiable risk need be accounted for in the cost of capital; regulatory and other asymmetric risk is fully diversifiable and hence need not be considered.

4. Efficient capital markets permit one to ignore regulatory and other asymmetric risks.

The first objection is factually incorrect, because investors in unregulated industries that face the kinds of asymmetric risk we discuss here receive precisely the kind of payoff structure we propose. The junk bond example used at the outset provides an obvious analogy.

Objections 2 and 3 are mutually inconsistent. The DCF objection claims that regulatory and other asymmetric risks are real but already accounted for, while the CAPM objection claims that they may be safely ignored because they are fully diversifiable! In fact, neither is correct.

The answer to both objections is simply to return to the definition of the cost of capital: the *expected* rate of return in capital markets on alternative investments of equivalent risk. The logic of Figures 4 and 7 prevails regardless of the way in which the cost of capital is measured, and it in no way contradicts the assumptions of either model for computing the cost of capital. Regardless of the method used, if the cost of capital is measured perfectly, Figure 4 demonstrates that it is an inadequate allowed rate of return in the presence of material asymmetric risk.

The last objection seems to be that our reasoning rests on a hidden market imperfection or on persistent stupidity by investors. Neither is correct.

The logic of Figures 4 and 7 assumes no market imperfections to reach its conclusions. Nor does it depend on investor misperceptions of the regulatory climate or rejection of efficient capital markets in the determination of the asset values. Indeed, as made clear in Figure 4, the valuation model that underlies our logic is absolutely standard. Our logic relies on the same assumptions about efficient capital markets as does almost every axiom of modern finance theory. It merely states that if regulation gives utility stocks a payoff structure like that of junk bonds, then like a company that issues junk bonds, regulation will have to promise a higher rate of return than the cost of capital in the "no-default" outcome.

IV. Regulatory Responses to *Duquesne*

The *Duquesne* opinion states: "[T]oday we reaffirm these teachings of *Hope Natural Gas* . . . ."[120] While the Court intended to reaffirm *Hope*, the economic logic of the *Duquesne* opinion imposes new requirements on regulators seeking investment in high-risk areas such as new baseload electric generation.

Whether the Court also has reaffirmed rate regulation as it has evolved since *Hope* depends on whether investors and regulators can agree to a mutually acceptable regulatory contract that meets the new tests set forth in *Duquesne*. We suggest that this agreement may be quite hard to reach.

First, this Court's *presumption* that the allowed rate of return accounted for regulatory risk generally does not hold true. Indeed, we can say flatly that regulatory risks are not captured adequately by traditional ratemaking methods used in regulatory proceedings. These methods attempt to equate the allowed rate of return for the regulated firm to the cost of capital. The cost of capital by definition is the *expected* rate of return, while the allowed rate of return should equal the equity equivalent of the fair *promised* rate of return given the regulatory risk.

The gravamen of the opinion is that regulatory risks must be specifically identified and a risk premium added to the otherwise applicable cost of capital when establishing the allowed rate of return. Unfortunately, methods for estimating the effects of regulatory risk on the necessary allowed rate of return are inadequate because the probability and expected size of the loss are difficult to determine. Moreover, the fair rate of return may be so high that it triggers even more regulatory risk, further exacerbating the problem.

The problem is even worse when the size and likelihood of a loss are influenced by regulatory decisions, as is ordinarily the case. In this case, investors may perceive potential losses to be based on subjective and political factors. Explicit payments to investors for the regulatory risk may increase the likelihood of investor losses because of moral hazard: once having paid for the right to impose a loss, regulators may feel free—even bound—to do so.

An important consequence of *Duquesne* is that retroactive changes in the "rules of the game" become an inherent risk in regulation and will be deemed proper as long as (a) the regulatory commission adjusts, *ex ante*, the allowed rate of return to reflect the fact that the rules may change during the game, or (b) the losses from the change are slight. Investor perceptions of an

120. *Duquesne*, 488 U.S. at 310.

increased risk of future regulatory change are inevitable under these conditions, particularly given the underestimated economic loss in *Duquesne*.

An economic environment with increasing business risk, combined with a perception of high regulatory risk, may cause serious problems, including underinvestment in regulated industries and economically inappropriate incentives for industry operation. The regulatory risk premium that regulators are willing and able to pay in these circumstances simply may be insufficient to overcome these problems.[121] In these circumstances, *Duquesne* may put the last nail in the coffin of the prudent original cost rate base/opportunity cost of capital standard that has evolved since *Hope*.

Unless regulatory institutions change to accommodate the economic realities identified above, failure to account explicitly for regulatory and other asymmetric risk will usher in a new era of an undercapitalized public utility sector. Regulated firms will have strong incentives to defer investment and utilize small scale technology that is below minimum efficient scale. We are already beginning to see a "reverse Averch-Johnson-Wellisz (A-J-W) effect," whereby some public utilities will be starved for capital.[122] Potentially inefficient forms of industry structure may also emerge as regulated firms minimize the assets exposed to opportunistic behavior by regulators.

We see three possible regulatory responses that may follow in the aftermath of *Duquesne*. The first possible regulatory response is to reaffirm *Hope* by meeting the requirements imposed by *Duquesne*. To this end, regulators will have to announce the rules of the game in advance of play and account for regulatory risk explicitly.[123] This scenario has the best chance of success if

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121. One way around some of these problems is to offer compensation through some device other than the allowed rate of return. However, moral hazard remains if an insurance premium or similar fee is added to the approved cost of service, and *ad hoc* adjustments in other cost items may not be a sufficiently reliable remedy for investors.

122. The "Averch-Johnson-Wellisz (A-J-W) effect" of alleged incentives for over-investment in regulated firms depends crucially on the assumption that the rate of return allowed by investors exceeds the cost of capital. *See* Averch & Johnson, *Behavior of the Firm under Regulatory Constraint*, 52 AM. ECON. REV. 1052-69 (1962); Wellisz, *Regulation of Natural Gas Pipeline Companies: An Economic Analysis*, 71 J. POL. ECON. 30-43 (1963); Baumol & Klevorick, *Input Choices and Rate-of-Return Regulation: An Overview of the Discussion*, 1 BELL J. ECON. 162-90 (1970); Bailey & Malone, *Resource Allocation and the Regulated Firm*, 1 BELL J. ECON. 129-42 (1970). To the extent that the A-J-W effect has been inferred from an allowed rate of return in excess of the cost of capital, the entire literature must be reexamined in light of the above demonstration that such a relationship is not *per se* an incentive for overcapitalization. That is, an allowed rate of return above the cost of capital but below that required to compensate for regulatory risk leads to incentives for *under*capitalization.

Indeed, the experience of the 1980s suggests that all theories of regulation might benefit from a fresh look. Various theories of the economics of regulation may be found in R. Posner, *Theories of Economic Regulation*, 5 BELL J. ECON. 335-58 (1974); G. Stigler, *The Theory of Economic Regulation*, 2 BELL J. ECON. 3-21 (1971); R. Posner, *Taxation by Regulation*, 2 BELL J. ECON. 22-50 (1971); S. Peltzman, *Toward a More General Theory of Regulation*, 19 J. L. & ECON. 211-40 (1976).

123. *See, e.g.*, Kalt, Lee, & Leonard, *Re-establishing the Regulatory Bargain in the Electric Utility Industry* (1987) (unpublished manuscript available from authors), suggesting a more precise definition of

regulators choose ratemaking mechanisms that minimize regulatory risk and refrain from exploiting the window of constitutional magnitude by avoiding retroactive changes in the rules that are adverse to investor interests. If this is the approach, the (1) prudent original cost test is preferred over the (2) modified prudent investment test, which in turn is preferred to the (3) used and useful test.[124]

If regulators still wish to reserve the right to switch the rules while reaffirming *Hope*, they must develop objective means of measuring the risks and implementing the Court's test that are free from moral hazard. Currently, we do not see a mechanism that would do so. When considering retroactive changes in the rules, regulators will have to identify the risk structure inherent in the current scheme, as the Court did in *Duquesne*. They will also have to consider the consequences for future capital investment. They may conclude that the long term gains from consistent application of past rules, despite their drawbacks, will offset the short term benefits from switching to another ratemaking methodology.

Many things will have to go right for regulatory institutions to return to anything like the world we used to know. "Constitutional magnitude" may be too vague a test for investors, and the necessary allowed rate of return may be unacceptably large for regulatory commissions. The stated or unstated intention of many electric utilities to avoid new construction of generating capacity[125] reflects a situation where perceived regulatory risks have driven the necessary allowed rate of return to levels that regulatory commissions find unacceptable.

Second, regulators and investors may attempt to impose contractual limitations on regulatory discretion to change the rules. For the electric utility industry, this is essentially the path of cogeneration and power production contracts. However, if regulators can change the regulatory compact within the bounds of constitutional magnitude so easily, why can't they do the same to a formal contract that is retroactively found to be unused or unuseful, or merely unfortunate?

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regulatory compact.

124. This future would be facilitated if the Court had an opportunity to rule on a case where the windfall loss to investors from adverse regulatory transitions exceeded the level of constitutional magnitude, particularly if the tests used to measure the magnitude were better. We are aware of no good test case for such a ruling at present.

125. *See, e.g., PS Indiana to Minimize New Plant Spending until State Changes Attitude*, ELECTRIC UTIL. WEEK, Apr. 29, 1985, at 3. Public Service Company of Indiana shareholders voted overwhelmingly to "minimize future capital investment for the purpose of constructing new generating plants," until the treatment of investment in new plants improves in Indiana, because "the investments of the company shareholder should not be unreasonably put at risk through large capital programs to meet [future] demand."

The imposition of contractual limitations on regulatory discretion may be aided by the current reluctance to sink new capital into traditional generation. In particular, regulators' ability to change contractual arrangements will be reduced if the entity they regulate, the utility, has as few assets on the table as possible.[126] In any case, attorneys for utilities, regulatory agencies, and investors may find their skills tested in finding contractual terms mutually acceptable to all concerned.

A third regulatory response seems to be a strong possibility in the mind of the Court:

> . . . [R]igid requirement of the prudent investment rule would . . . foreclose a return to some form of the fair value rule just as its practical problems may be diminishing. The emergent market for wholesale electric energy could provide a readily available basis for determining the value of utility assets.[127]

Such a fair value rule would restore regulatory symmetry in a different way from the pure prudent investor standard. Instead of a system that prevents large losses to offset the regulatory prevention of large gains, the Court describes a system that permits investors the possibility of large gains to offset the risk of large losses.

With this third response, rate regulation will have come full circle back to the fair value standard that predated *Hope*. Only this time, asset value will not be based on the subjective engineering studies that Justice Brandeis found so troubling.[128] Rather, it would be based on market prices for electricity, presumably determined by reference to the transactions that are evolving under the second, contractual response. A willingness by regulators to accept whatever the market dictates, even when such rates are far higher than they would have been under the pure prudent investment rule with an original cost rate base, would be a necessary step toward preventing a "heads I win, tails you lose" regulatory environment under this third response.

In practice, we are likely to experience a combination of these three responses. The first will call for new and improved methods to measure regulatory risk and its effect on the necessary allowed rate of return (or for

126. Contracts can be bought out at shareholder expense only by companies with the resources to do so. Thus, the payout to investors—instead of reinvestment—of cash generated by the business, which puts the money beyond the reach of regulators, is an economically rational response to regulatory risk.

127. *Duquesne*, 488 U.S. at 316, n.10.

128. Missouri *ex rel.* Southwestern Bell Tel. Co. v. Public Service Comm'n, 262 U.S. 276 (1923). *See* discussion *supra* notes 11 & 33.

other cost adjustments) and the development of improved ways to reduce regulatory risk. The second will call for economic and legal analysis to design contracts with appropriate, enforceable incentives for all. And the third will require development of better approaches to eliminate regulatory risk and to measure the value of assets based on market transactions.