

# THE TRENDED vs. DEPRECIATED ORIGINAL COST CONTROVERSY: HOW REAL ARE THE REAL RETURNS?

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## I. BACKGROUND AND PURPOSE

In the late 1970s and early 1980s, a number of economists asserted in journal articles or in testimony before the Federal Energy Regulatory Commission (FERC or Commission) that the real rates (tariffs or prices) charged by those public utilities regulated under traditional cost of service regulation (using a depreciated original cost (DOC) rate base with nominal rates of return, *i.e.*, rates of return which contain a built-in adjustment for expected inflation) would decline over time.<sup>1</sup> These economists claimed that regulation under their proposed methodologies, which generally feature a rate base adjusted for inflation together with real<sup>2</sup> rather than nominal rates of return applied to this rate base, would not only produce leveled real tariff rates<sup>3</sup> over the life of the investment, but would create a regulatory regime under which time patterns of prices were more akin to those in the non-regulated, competitive world.<sup>4</sup> These assertions, however, were not backed by significant theoretical proof, nor were they tested using actual data, although there were

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1. Robert E. Anderson, *Compensation for Inflation Under Alternative Regulatory Formulas: A Rejoinder*, PUB. UTIL. FORT., Dec. 6, 1979, at 32; and Peter Navarro et al., *A Critical Comparison of Utility-Type Ratemaking Methodologies in Oil Pipeline Regulation*, 12 BELL J. ECON. 392 (1981). See also Direct Testimony of Michael C. Jensen, Williams Pipe Line Co., Docket No. OR79-1, *et al.* (July 12, 1979); Direct Testimony of Stewart C. Myers, Williams Pipe Line Co., Docket No. OR79-1, *et al.* (July 13, 1979); and Robert E. Anderson & David E. Mead, *A Comparison of Original Cost and Trended Original Cost Ratemaking Methods*, ENERGY J., Apr. 1983, at 151.

2. In the arcane language of economics, real does not mean genuine. Rather, it is a measurement which has the estimated effects of inflation removed by use of a deflator. The deflator is usually an estimate of inflation developed by some government agency such as the Department of Commerce or the Bureau of Labor Statistics.

3. Leveled real tariff rates are tariff rates which, when adjusted for the effects of inflation, are the same each time period. Hence, one would always pay the same inflation-adjusted tariff rate for any given utility service.

4. The rate base is the capital investment on which the regulated utility is allowed to earn a return. In most cases, the regulatory commission sets the tariff or rate the utility is allowed to charge by dividing projected costs by projected sales volumes, or:

$$R = C/V, \text{ where:}$$

$$R = \text{Tariff rate}$$

$$C = \text{Total projected cost of service}$$

$$V = \text{Projected sales volumes.}$$

some data available to test the hypotheses.<sup>5</sup>

Partly because of the proliferation of these new ratemaking theories, the FERC decided in 1985 to regulate oil pipelines (those which transport crude oil, petroleum products, and natural gas liquids) using a method quite similar to the closely-related methodologies proposed by those economists: trended original cost (TOC).<sup>6</sup> The FERC has continued to regulate natural gas pipelines by DOC. The two forms of regulation have existed side by side for approximately six years. As a result, data are now available for limited tests of several of the hypotheses made by TOC advocates, particularly the hypothesis that TOC is a better reflection of the non-regulated, competitive world.<sup>7</sup> In addition, data have long been available to test the hypothesis that real rates under a DOC regulatory regime decline over time.

This paper will address a number of questions. Do real tariff rates really

The cost of service is determined by a formula such as:

- C = D + E + e(I<sub>e</sub>) + d(I<sub>d</sub>) + T, where:  
 D = Depreciation  
 E = Operating, maintenance, and general expenses  
 e = Equity return  
 I<sub>e</sub> = That portion of rate base, or fixed investment, financed by equity  
 d = Debt return  
 I<sub>d</sub> = That portion of rate base, or fixed investment, financed by debt  
 T = Taxes.

Although the formula can become more complicated in the details and applications, these equations describe the essential process. Several things are important to note. First, the formula remains the same under both DOC and TOC but the difference is that the values of depreciation, return, rate base, and taxes are different at any given point in time, due to the allowance of real rather than nominal returns to capital. However, as will be explained later in greater detail, both ratemaking methods are purported to recover the same costs over the life of the project. Second, all parties involved are primarily concerned with the tariff rate, R. The rate must be, in lawyers' parlance, "just and reasonable," or must be high enough to produce expected revenues adequate to compensate investors and attract capital, but not so high as to allow exploitation of monopoly power. *FPC v. Hope Natural Gas Co.*, 320 U.S. 591 (1944); *Bluefield Waterworks v. PSC*, 262 U.S. 679 (1923). The projected cost of service and sales volumes are important in deriving the rate, but one should not focus on one item, such as the rate of return, and lose sight of the rate. Third, the costs and volumes are projected figures. An *ex ante* examination of costs and revenues will generally show that the numbers missed the mark. Nevertheless, they may be closer than cost and revenue estimates of a more competitive industry.

5. While they did not provide empirical evidence, Anderson and Mead ran computer simulations which show how changes in yearly inflation rates and utility growth rates affect the different regulatory schemes. While their analysis does not go far enough in relaxing some of the ratemaking assumptions contained in previous papers and testimony, it does show that some claims made previously regarding the effects of using the different rate base methodologies depend heavily on the underlying assumptions.

6. *Williams Pipe Line Co.*, 31 F.E.R.C. ¶ 61,377 (1985) [hereinafter Opinion No. 154-B] and *Williams Pipe Line Co.*, 33 F.E.R.C. ¶ 61,327 (1985) [hereinafter Opinion No. 154-C].

7. There may be a problem in drawing conclusions from the oil pipeline financial data. It can be argued that the Commission has had too few oil pipeline rate cases to establish TOC as its standard for regulating this industry and that oil pipeline tariffs in reality are set by the market (some argue the rates reflect competition, others argue they reflect market power). At this writing, there has only been one litigated case in which rates have been decided by the Commission. *ARCO Pipe Line Co.*, 52 F.E.R.C. ¶ 61,055, *modified*, 53 F.E.R.C. ¶ 61,398 (1990). Hence, the financial data of this industry may not be reflective of the TOC methodology. However, the proponents of the TOC methodology have argued that TOC is indicative of the way companies price in the unregulated sector. If their arguments are correct, it would stand to reason that, if the oil pipeline industry is not heavily regulated, the industry financial data should nevertheless fairly closely follow the TOC time path, *i.e.*, real rates should be level over time.

decline under DOC regulation? Are real rates under the alternative TOC method level over the lifetime of the project? If the answers to both questions are "yes," is it because the theory is correct or is it coincidence? Which is the better methodology for regulatory policymakers to use? Our approach to answering these questions will first review the historical and legal background of rate base controversies. We will then discuss the papers and testimony which advocate the use of the trended rate base style of regulation and note the lack of theoretical and empirical proof. Next we will describe the workings of the regulatory process and show that the trended original cost model advocates make assumptions which are at best exceptions or special cases rather than examples of day-to-day regulatory practice.

Does this mean that the TOC concept is invalid for regulatory application? Not necessarily. In fact, the TOC model can just as easily be applied to utility regulation as DOC, since only the values within the basic regulatory formula change. Nevertheless, many of the claims made for it, in terms of its ability to replicate the competitive economy to a greater degree than DOC, appear to be unfounded.

Finally, this paper will compare economic evidence on rate levels using financial data on interstate natural gas pipelines, published by the Energy Information Administration of the Department of Energy, with price data on oil pipelines, contained in a Producer Pipeline Index (PPI) series developed by the U.S. Department of Labor, Bureau of Labor Statistics (BLS).<sup>8</sup> The average gas transportation rates obtained will be adjusted for the effects of inflation using the finished goods PPI. The commodity costs of the gas transported and sold by the natural gas pipelines will be removed, to the extent possible, from the financial statistics of these pipelines. This is because not only are most gas producer rates now deregulated or market priced, but any regulated producer rates which are in our time series data have not been regulated in the same manner as pipeline transportation rates. Thus, the inclusion of these gas costs mixed with transportation costs would distort the findings.

## II. HISTORICAL PERSPECTIVE

The current controversy is deeply rooted in the historical controversy between the use of a depreciated original cost rate base and the fair value rate base. The DOC rate base measures the amount of fixed investment for the provision of utility services in actual dollars, as adjusted, not only for depreciation, but also using some rather complicated accounting concepts such as an allowance for funds used during construction and normalized taxes.<sup>9</sup> In contrast, the fair value rate base concept is an attempt to measure the fair value of the property committed to public use. Fair value is defined as the current value or replacement cost of the used and useful property committed to public

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8. This particular analysis, which offers empirical evidence on the TOC vs. DOC controversy, will be useful primarily in the future, since not only is the BLS' oil pipeline series relatively new, but the BLS has apparently lost several years of oil pipeline data.

9. CHARLES F. PHILLIPS, *THE REGULATION OF PUBLIC UTILITIES*, at 284, 311, and 315 (1st ed. 1984).

service.<sup>10</sup>

The fair value rate base concept preceded the original cost rate base concept in public utility regulation. Under a fair value method, a current rate of return was applied to the fair value to generate the required revenues and taxes in determining the rates the regulated firms were allowed to collect.<sup>11</sup> However, some regulators and students of the regulatory process began to have doubts about the fair value rate base. For example, fair value was one more item to be estimated (usually through engineering valuation studies) and argued over in the hearing process, whereas an original cost rate base was not subject to the same controversy since it could be readily verified from the company's books.<sup>12</sup> Another problem was that the current cost of capital was applied to the rate base. Opponents of the fair value method pointed out that there was a circularity problem in that the rate of return heavily influenced the value of the firm, and hence its rate base, and the same regulatory body determined both the rate of return and the value of the rate base.

The battle between the fair value forces, led by Harry Gunnison Brown, and the original cost proponents, who had James C. Bonbright as their chief spokesman, was probably the hardest fought battle in regulatory history. The arguments raged throughout the 1920s and 1930s.<sup>13</sup> The proponents of original cost ratemaking seemed to carry the day with the Supreme Court's issuance of the *Hope* decision in 1944.<sup>14</sup>

However, economic issues do not die easily. Several decades later, opponents of the original cost rate base were back with the argument that under DOC there was a front-end load created by depreciating the rate base so that the investors in the early years paid higher rates on the new assets than investors in later years, who paid lower rates on the depreciated plant. If indeed it was a problem, it could easily be fixed by eliminating depreciation charges from the cost of service or by deferring collection of depreciation charges.<sup>15</sup>

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10. FRANCIS XAVIER WELCH, *CASES AND TEXT IN PUBLIC UTILITY REGULATION*, at 272-273 (1968). The concept of fair value is commonly applied in assessing real estate for property taxes or in compensating landowners in eminent domain proceedings.

11. The fair value methodology emerged from the Supreme Court's decision where the Court ruled that, "The basis of all calculations as to the reasonableness of rates . . . must be the fair value of the property being used." *Smyth v. Ames*, 169 U.S. 466, 546 (1898).

12. There still may be arguments over prudent investment and the amount of investment that is used and useful in the provision of jurisdictional (that which the regulatory body regulates) public service. However, the arguments are available no matter what rate base methodology is used.

13. For a discussion that does this controversy more justice than this paper can, see JAMES C. BONBRIGHT ET AL., *PRINCIPLES OF PUBLIC UTILITY RATES* (1988). See also, JAMES C. BONBRIGHT, *VALUATION OF PROPERTY*, Vol. 1 and 2 (1988); Harry Gunnison Brown, *Railroad Valuation and Rate Regulation*, 33 J. POL. ECON. 505-530 (1925); and other references listed in JAMES C. BONBRIGHT ET AL.

14. *FPC v. Hope Natural Gas*, 320 U.S. 591 (1944). This decision did not specify that original cost was to be the ratemaking standard, but did make its use legally acceptable. Most, but not all, regulatory commissions now use original cost. FRANCIS XAVIER WELCH, *CASES AND TEXT IN PUBLIC UTILITY REGULATION* at 307 (1968).

15. Of course, a higher rate of return would be necessary to compensate investors for giving up their rights to recoup the original cost of their investment if depreciation was eliminated from the cost of service. Likewise, in the case of a deferral of depreciation charges, a higher rate of return or some sort of carrying charge would be required in order to compensate for the deferral of these collections. However, there would be no front-end load.

These potential solutions were not advanced by DOC's critics.<sup>16</sup> Instead, opponents of DOC used the front-end load argument to buttress arguments for a radical switch to the trended original cost rate base.<sup>17</sup>

The most recent regulatory forum for the extension of this rate base controversy is the *Williams Pipe Line Co.* case. This oil pipeline rate case, initiated by shipper complaint, began at the Interstate Commerce Commission (ICC) as the Ex Parte 308 case in 1972 and was subsequently transferred to the FERC by Congress when the ICC's oil pipeline regulatory functions were assigned to the FERC at the creation of the Department of Energy in 1977. The case was brought (during a period of high inflation rates, it should be noted) by a group of shippers on the Williams pipeline system. Oil pipelines at the time were regulated (if one can call it regulation, since there were very few formal oil pipeline rate cases between 1944 and 1972) by a fair value "valuation" method which made use of the Oak Formula, named after an ICC engineer, Jesse Oak, who was its primary author.<sup>18</sup> The shippers argued for

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16. In fact some critics, such as Professor Myers, argued in favor of accelerated depreciation for tax purposes, while at the same time, advocating the use of TOC. See Direct Testimony of Stewart C. Myers, *supra* note 1.

17. The authors note that they do not put much stock in the front-end load arguments. The sole reason a front-end load exists is that the rate base is depreciated through charges which are recovered in rates. This supposedly leaves smaller and smaller portions of the rate base upon which to apply the cost of capital and upsets some economists' notions of inter-generational equity. However, even in the case of a fairly static utility, the rate base depreciates slowly while additions and replacements, some of which are greater in cost than the original plant, tend to make the rate base grow over time. Moreover, in the case of a static pipeline serving a finite source (as is the case with some Alaskan oil pipelines), the annual throughput tends to peak during the early (front-end) years. Given a typical straight line or leveled annual depreciation expense, the per unit depreciation expense is less on the front-end shippers and greater on the tail-end shippers. This has the effect of offsetting any front-end problem inherent in DOC.

Also, as plant and equipment ages, expenses such as operating costs and fuel costs due to line losses increase. For example, Trailblazer Pipeline Company, which was made subject to a ratemaking scheme somewhat similar to TOC, and did not wish to be regulated in this manner, argued in a rehearing application that its recent situation of a declining rate base cannot be expected to continue due to construction of new meters, interconnects, laterals, repair, and replacement. See Trailblazer Pipeline Company, "Application for Rehearing" March 19, 1990, in FERC Docket No. RP84-94. This means that future ratepayers, while perhaps paying less in total capital charges, may pay more in other expenses for a system which has become less efficient over time.

In addition, the proponents of TOC did not, as a rule, argue against the use of accelerated depreciation for tax purposes, even though this accounting methodology certainly would exacerbate any front-end load problem. See *supra* note 15.

One argument which would appear to have some validity (and was ignored by the TOC proponents) is that of initial excess capacity. Plant and equipment are put into place with future growth in mind, and ratepayers in the early years may be asked to pay for capacity which they do not currently need. However, a better method for dealing with this problem is to levelize or defer collection of depreciation charges until the capacity is more fully utilized. See *Wyoming-California Pipeline Co.*, 50 F.E.R.C. ¶ 61,070, at 61,170-171 (1990).

18. For a detailed analysis of the operation of the ICC's valuation process, see Peter Navarro & Thomas R. Stauffer, *The Legal History and Economic Implications of Oil Pipeline Regulation*, 2 ENERGY L.J. 291 (1981). The few oil pipeline cases at the ICC occurred in the early 1940s prior to the *Hope* decision. The Department of Justice, which apparently believed that the ICC was lax in its regulatory responsibilities, signed a consent decree with the major oil pipeline companies in the 1940s. *United States v. Atlantic Refining Co.*, Civil Action No. 14060 (D.D.C. December 23, 1941) reprinted in full in ANTI-TRUST SUBCOMM. OF THE HOUSE COMM. OF THE JUDICIARY, 86TH CONG., 1 SESS., REPORT ON THE CONSENT DECREE PROGRAM OF THE DEPT. OF JUSTICE, 370 (Comm. Print 1959). While this was not binding on the

original cost as did the Commission Staff and the Department of Energy. The oil pipeline representatives argued for continuation of the Oak Formula, or, if the Commission could no longer justify the continuation of that methodology, for use of a TOC methodology with a starting rate base equal to the current fair value rate base as established by the ICC and updated by the FERC. The Justice Department took a position somewhere in the middle, favoring original cost, but also arguing that TOC was useful for some pipelines.

The original *Williams* case was settled by the parties involved as far as *Williams*' actual rates were concerned. The FERC eventually issued a series of opinions which established the parameters of its oil pipeline regulation. The first was Opinion No. 154.<sup>19</sup> Much of the deregulatory philosophy contained in that decision, particularly the rationale used to continue the ICC's valuation rate base, was soundly rejected by the U.S. Court of Appeals.<sup>20</sup> It was followed by Opinion No. 154-B, which is the current basis for FERC regulation of oil pipelines, and Opinion No. 154-C, which clarifies sections of Opinion No. 154-B.<sup>21</sup>

Opinion No. 154-B established a regulatory methodology using trended original cost. It allows trending of only the equity portion of the rate base through the deferral and capitalization of the inflation component of the equity return. In other words, a real rather than a nominal equity return is applied to the original equity investment. The inflation portion of the return, the difference between real and nominal return, is deferred and added to the rate base, thus establishing an increasing or trended equity rate base. The original cost of the portion of the investment which is financed by debt in nominal dollars is used to determine and depreciate this share of the rate base (rather than using real debt costs and trending the debt). Probably one of the more important points established by Opinion Nos. 154-B and 154-C, at least from the standpoint of pipeline revenue generation, was the establishment of a transition or starting rate base equal to the equity valuation plus the debt original cost. However, as subsequently clarified in the ARCO rate case,<sup>22</sup> oil pipelines are not allowed to amortize the initial equity rate base write-up over original cost in the starting rate base. They are only allowed to recover the original cost of the fixed investment through depreciation charges based on the original cost of the plant and equipment. However, subsequent write-ups of the rate base, following the TOC methodology, are amortized through depreciation expense.

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ICC and legally (according to rulings in the various *Williams* proceedings) did not establish just and reasonable rates, the pipelines filed rates based upon the Consent Decree and the ICC accepted them for filing. This did not change until the Ex Parte 308 investigation in 1972, which became the *Williams* case at the FERC.

19. *Williams Pipe Line Co.*, 21 F.E.R.C. ¶ 61,260 (1982) [hereinafter Opinion No. 154].

20. *Farmer's Union Central Exchange v. FERC*, 734 F.2d 1486 (D.C. Cir.), cert. denied sub nom., *Williams Pipe Line Co. v. Farmer's Union Central Exchange*, 469 U.S. 1034 (1984). This same court with a different panel had indicated its displeasure with the valuation approach six years earlier in *Farmer's Union Central Exchange v. FERC*, 584 F.2d 408 (D.C. Cir.), cert. denied sub nom., *Williams Pipe Line Co. v. FERC*, 439 U.S. 995 (1978).

21. Opinion No. 154-B and Opinion No. 154-C, supra note 6.

22. *ARCO Pipe Line Co.*, 52 F.E.R.C. ¶ 61,055, modified, 53 F.E.R.C. ¶ 61,398 (1990).

### III. ANALYSIS OF EXISTING TOC LITERATURE

To the extent that the Commission relied upon economic arguments for its decision to use a TOC formula, the economic presentations were supplied in testimony presented by oil pipeline witnesses in the *Williams* case.<sup>23</sup> Other articles and papers were also available to influence the process. The following is a summary and analysis of some of the major works in this area.

#### A. *The Anderson Argument*

Dr. Robert E. Anderson presented his arguments in favor of the TOC methodology in a rejoinder to Dr. Thomas G. Marx, who in *Public Utilities Fortnightly* argued in favor of compensation for utility investors based upon applying the current nominal cost of capital to a fair value rate base, *i.e.*, the original fair value methodology.<sup>24</sup> Dr. Anderson pointed out that Dr. Marx's method overcompensates investors by allowing them to capture the costs of inflation twice: once in the rate base and once in the rate of return. He also correctly showed that, under certain assumptions, the present value of the returns to investors over the life of a proposed project are equal under both DOC and TOC.<sup>25</sup> These assumptions include a static rate base (one with no additions or retirements), constant straight-line depreciation, constant sales volumes, and inflation rates and other expenses which are either constant or increase only by the assumed constant rate of inflation over the life of the project.<sup>26</sup> In addition, Dr. Anderson argued that the TOC model more nearly replicated the pricing patterns of the competitive world than the DOC model.<sup>27</sup> While it may be correct that the DOC model does not necessarily produce the patterns of pricing normally found in the competitive world due to its reliance on accounting concepts rather than economic value, Dr. Anderson's assumption that TOC replicates competitive pricing patterns was simply treated as a truism and not proven in his article.<sup>28</sup> He further assumed that the competitive, non-regulated investor will accept a rate of return below the

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23. It should be noted that the TOC methodology, particularly as adjusted for the trending of only the equity portion of the rate base, is somewhat of a compromise between DOC and the Oak Methodology, and may well have been picked as the rate methodology of choice by the Commission for that reason.

24. Thomas G. Marx, *Compensation for Inflation under Alternative Regulatory Formulas*, PUB. UTIL. FORT, June 7, 1979, at 23.

25. Robert E. Anderson, *supra* note 1. In other words, the investor, when presented with a choice of either ratemaking option, should be indifferent as to which is chosen.

26. Unfortunately for Dr. Anderson's argument, experience shows that these assumptions are not realistic.

27. His empirical table, however, contains a mathematical error which makes his analysis somewhat confusing.

28. In Dr. Anderson's article (and the other articles which we will discuss), the concept of non-regulated, competitive pricing is not well defined. Do the authors mean the truly competitive world of price takers, where supply and demand reign supreme? If so, it can be seen by simple observation that, while most (but not all) prices rise in the long run in an inflationary economy, there is no discernable pattern of pricing which is both predictable and has validity across the spectrum of competitive markets (the first economist to find such a pattern stands to do well in the commodities markets). These markets reflect supply and demand. Or do these economists and finance experts mean the realm of oligopoly, monopolistic competition, and workable competition, where pricing strategies can be attempted? Here again, pricing strategies may vary (and may fail!). For example, the computer industry has followed a pattern of

current cost of capital in the early years after the asset is placed into productive use, because the investor knows that inflation will produce a rate of return on the asset in later years in excess of the cost of capital.<sup>29</sup> Again, his paper did not demonstrate why this would occur.

Even if we could accept the assumptions that the investor should be indifferent, there is one other problem: not only must investors be assured that competitive circumstances and future inflation will produce a rate of return on the asset in excess of the then-current cost of capital, but also that the project will survive to reap this reward. To achieve this assurance, one must assume there is no business risk. There is no evidence whatsoever that the competitive world is noted for its absence of business risk.

### *B. Verified Statement of Stewart C. Myers*

While most of Dr. Myers's testimony focused upon the preservation of the value of oil pipeline holdings to their current owners, Dr. Myers's testimony advocated a switch to the TOC methodology with recommendations that the Commission use the existing ICC valuation rate base as the starting rate base for TOC regulation. Dr. Myers argued that, absent rapid technological change, TOC more nearly replicated the competitive economy. His argument was as follows:

In the private, unregulated sector of the economy, the value of capital assets grows in basically the same way the rate base grows under TOC regulation. In the absence of rapid technological change, the value of capital assets in a competitive industry grows at approximately the rate of growth of the cost of reproducing them. The reason for this is simple: they can be resold to other investors at this cost, less a discount for cumulative "wear and tear."

Prices charged consumers are based on current, not historical asset values. As asset prices appreciate, prices charged consumers appreciate also. On average, competitive firms do earn a fair return (equal to the cost of capital) on current asset values. But this does not mean that competitive firms receive the full nominal cost of capital (i.e., the real cost of capital plus the inflation premium) as current earnings.

On the contrary, competition does not allow such "double-dipping." Unregulated firms know their assets will appreciate with inflation, and competition forces them to accept a correspondingly lower rate of current income. Of course, expected total income (current income plus asset appreciation) covers the

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introducing new products at a high price and cutting the price over time to attract more and more customers. This form of price discrimination runs counter to what one would expect in a TOC world.

29. Much work on TOC was done in a period in which housing prices were rising. Many TOC advocates assumed, perhaps without rigorous thinking, that the value of a firm's assets increases with inflation since housing prices increased during this period and houses are fixed assets (was it the sticks and stones which increased in value, or the scarcity value of the land?). The authors would argue that those who accepted a rate of return less than the current cost of capital were, besides simply acting as price takers, en masse, operating on the greater fool theory (that is, some greater fool would pay more for the assets at some time in the future). At least one of the authors is old enough to recall that investors paid \$1.00 for \$0.50 worth of uncirculated pennies in the early 1960s, because they believed the price would be at least \$2.00 the next year. Also, if the stock market reflects the value of a firm's assets, which it does, the authors can assure these advocates that their premise of guaranteed higher asset prices due to inflation is not necessarily true. In fact, the stock market did not do as well in the high inflation years of the 1970s as it did in the lower inflation 1980s.



competitive firms' costs of capital.<sup>30</sup>

It should be noted that this argument was made without the benefit of theoretical or empirical proof; the author expected the readers of his testimony to accept the argument on faith. However, at least four strong criticisms of this line of reasoning exist:

- (1) The replacement cost of assets used in production is only relevant in a competitive market when combined with other factors of production. Capital assets are combined with labor, management, raw materials, other factors of production, and other costs to produce goods and services. Not all firms in a particular market will have equal quantities of each. Even if technological change is merely continuous rather than rapid, it still creates obsolescence and makes different factor combinations more efficient over time. Good management can squeeze more productivity out of a particular firm, thus increasing the firm's value. It is the replacement cost of producing these goods and services taking all of these other things into account that is relevant, not merely the replacement costs of just the assets themselves.
- (2) The demand for the good or service in question may change independently of replacement cost. For example, if there is no demand for the crude oil in a certain field, or if the supply of oil from that field dwindles, the economic value of the oil pipeline which carries that oil would drastically decline regardless of what it would cost to replace the pipe.<sup>31</sup>
- (3) After a decade of lower inflation rates, large numbers of mergers and acquisitions, a significant increase in the price of stocks, and two stock market crashes, it is easy to see that asset values, replacement costs, and inflation may be widely divergent, as indeed they were in the 1980s.<sup>32</sup>
- (4) There is no theoretical or empirical proof to be found in either the economic or financial literature that a competitive firm will receive less than the nominal rate of return in early years and greater than the nominal rate in later years on its assets.

Dr. Myers also tested his assumptions about the workings of the ICC's fair value methodology; *i.e.*, the valuation methodology, which he thought conformed more closely to his theories, by creating a hypothetical pipeline

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30. Direct Testimony of Stewart C. Myers, *supra* note 1, at 41-42. That Professor Myers and other economists and finance professors are troubled by the use of a DOC rate base is not surprising, because it also has no relationship to economic value. It is merely a measure of the amount of capital dedicated to the provision of the service. As was argued successfully by Bonbright and others many years ago, returns on assets create value and regulatory commissions establish returns. Hence, a value-oriented rate base is circular.

31. For example, Milne Point Pipe Line Company, a pipeline which runs from the Milne Point field in Alaska to an interconnect with the Trans-Alaska Pipeline System, filed rates with the FERC. Milne Point Pipe Line Co., 33 F.E.R.C. ¶ 62,053 (1985). These rates were subsequently withdrawn because the Milne Point producers did not believe it was economical to produce their oil at that time. Milne Point Pipe Line Co., 38 F.E.R.C. ¶ 61,279 (1987). This decision almost certainly did not increase the value of the pipeline.

32. According to a recent article in reference to corporate sell-offs of assets, "As the asset sales gain momentum, some investment bankers say, this is adding to the downward pressure on asset values in the U.S." Randall Smith, *Rash of Corporate Sell-Offs Undercutting Asset Values*, WALL ST. J., Nov. 7, 1990, § C, at 1, col. 3.

with financial characteristics conforming to Dr. Myers's assumptions about how this methodology worked. For example, his model assumed that oil pipelines did not earn more than the ICC Guideline rate (8% equity return on crude oil pipelines and 10% return on products lines as applied to a valuation rate base), even though at the time there were actual rate data available which would have shown that this was not necessarily true.<sup>33</sup> Why he chose this method rather than testing his hypotheses using data from actual pipelines was not explained.

### C. *Verified Statement of Michael C. Jensen*

Professor Jensen's testimony is similar to Dr. Myers's. He called his rate base methodology inflation-adjusted original cost, but its difference from TOC is slight. There was one important difference in his arguments, however. He testified that the Commission could adjust only the equity portion of the rate base, leaving the debt portion at original cost, without doing real damage to his theories. His method featured automatic yearly adjustments to rates. Like Dr. Myers, he appeared to believe (erroneously) that the allowed return under the DOC methodology is a maximum. In addition, he did not realize that the rate of return is normally adjusted in subsequent rate proceedings for both current risk and inflation, and not set in stone when the assets are placed into service.<sup>34</sup>

### D. *Navarro, Peterson and Stauffer (NPS)*

The NPS article provides the most extensive analytical support for the concept of levelized real rates, or a TOC methodology. The authors of this article demonstrate, as did Dr. Anderson, that if certain assumptions hold (*i.e.*, a static rate base, constant straight-line depreciation, constant sales volumes, expenses which appear to either be constant or increase only with the rate of inflation, and constant inflation rates), the TOC model will over time generate level real tariff rates. These level real rates translate into increasing nominal tariff rates and nominal rates of return to investors. In contrast, under these strict assumptions, the DOC model produces declining real tariff rates and declining nominal tariff rates with a constant nominal rate of return. The authors also point out that the TOC methodology is not the methodology

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33. Like an alarming number of economists and finance professors who venture into the regulatory arena, Dr. Myers apparently was not aware of the "filed rate doctrine" which establishes, among other things, that a regulated firm with approved rates on file is not allowed to make up previously deficient returns nor is it required to disgorge profits in excess of those allowed in its rates. See, *FPC v. Sunray DX Oil Co.*, 391 U.S. 9, 24 (1968); *FPC v. Tennessee Natural Gas Co.*, 371 U.S. 145, 152-153 (1962); and *Montana-Dakota Utilities Co. v. Northwestern Public Service Co.*, 341 U.S. 46, 254 (1951). Hence, he apparently erroneously assumed that amounts collected in excess of the guideline amounts were refunded to the pipelines' customers.

34. Direct Testimony of Michael C. Jensen, *supra* note 1. Dr. Jensen's testimony contained a monetarist's view of inflation: all prices rise by the amount of inflation, which is the same for all goods and services, but underlying supply and demand conditions also work to produce different changes in prices of different goods and services. However, even if one assumes this is true, the only measures of inflation available are price indexes, such as the CPI and GNP deflator, which contain both types of price increases. Hence, the monetarist rate of inflation cannot be captured analytically to use in the TOC rate base.

likely to be preferred by a new company because the payout of returns to investors is deferred.

That the authors assumed the static conditions they did is rather surprising given the nature of one of their conclusions:

Characteristically, each component in the calculation of rates is adjudicated or negotiated separately and then reassembled into a package—witness our discussion of the ICC valuation formula. This is inherently fallacious, since the formulas involve the interaction of all the separate terms, in a nonlinear, nonadditive fashion. The “whole,” i.e., the ROR, may be more or less than the sum of the parts, and the net effects cannot be estimated without simulation calculations.

Indeed, the effect of any given parameter or accounting option cannot be predicted in advance—often not even the sign of the effect—without specification of the entire package. Thus, the ratemaking process, in its present form, which purports to be objective, is in fact quite capricious in the sense that the ultimate impact is not knowable.<sup>35</sup>

In fact, NPS have it exactly backwards—regulators, as well as all parties involved in the regulatory process, are keenly aware that the tariff rate is the sum of the parts. The regulatory formula (*supra* note 4) is no mystery to those involved in the process. Real (*i.e.*, genuine, not inflation adjusted) dollars are riding on the outcome of the process! Interestingly, it is NPS who, after providing a formula which purports to take into account all parameters in the ratemaking process, focus strictly on one parameter, the rate of return, in their analysis.<sup>36</sup>

#### *E. Anderson and Mead*

The work of Anderson and Mead purported to compare the time paths of allowed revenue to recover capital costs of both DOC and TOC regulated firms.<sup>37</sup> To perform the comparisons, they ran computer simulations, which first held key parameters constant, while varying the growth rate of a utility's investment base and the rate of inflation. Varying these rates reflects more realistic real world assumptions than do the other studies, given that utilities do expand and measured inflation has not been constant over time. However, Anderson and Mead mistakenly assumed, as did the other studies, that sales volumes and cost of service expenses remained constant. In fact, volumes and expenses fluctuate, with volumes changing with demand and growth and expenses increasing with, but not necessarily proportional to, inflation and asset age. Anderson and Mead conceded that tariff rates were affected by these changes and, as a result, while real tariff rates under DOC did not necessarily decline, neither did real rates under TOC necessarily remain the same.

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35. Navarro et al., *supra* note 1, at 408.

36. Their regulatory formula assumes that sales volumes remain constant over the life of the project. It is difficult to determine whether their formula assumes that all other costs contained in the cost of service either remain constant or increase exactly with the rate of inflation. At any rate, there is no treatment of these other costs in their paper.

37. Robert E. Anderson & David E. Mead, *supra* note 1, at 152. Actually, their simulations compared tariff rate levels rather than allowed revenues, but rates generate revenues. The distinction may not be important for comparing two ratemaking methodologies, but can become very important when one is attempting to compare TOC or DOC with the unregulated economy.

The findings of Anderson and Mead can best be interpreted not in terms of the rates generated by each method in comparison with general price levels (as they attempted to interpret their findings), but in terms of the rates generated by each method in comparison with the other.

Of course, to even go so far as to interpret their findings in this manner, one must assume that the demand elasticity of the services produced by the regulated firm is sufficiently inelastic so the choice of method does not affect sales volumes. But, one might ask, does this not affect the usefulness of any such comparison? The answer is yes. Why? Because changes in other operating expenses, the depreciation rate, and tax rates, not to mention sales volumes and regulatory lag, are reflected in real world tariff rates. Hence, there is a limit to the usefulness of their study.

#### IV. SUMMARY OF DEFICIENCIES IN THE TOC PROPOSALS

The papers and testimony on this modern rate base controversy are uniformly unsatisfying. While proponents of TOC offer a regulatory regime which purportedly would cure the deficiencies of original cost ratemaking, they present scant empirical and economic evidence that their thesis is correct, *i.e.*, TOC is the superior method for regulatory ratemaking. Their assumption that all costs other than the rate base are constant, or at least only change with inflation and that sales do not vary over time, may help to show how, when applied, the methodologies differ from each other. However, these assumptions did not permit the TOC proponents to establish a time pattern of either tariff rates or rates of return.

Certainly, a regulatory process which bases profits on the non-economic concept of assets which decline in value after they are placed into service, regardless of the rate of inflation or demand for these assets (DOC), is of concern to economists. However, the following considerations are useful to bear in mind:

- (1) Under any regulatory regime, all costs and sales volumes are subject to fluctuations. Rates are typically determined by dividing estimated costs by estimated sales volumes. Therefore, while the valuation of the rate base figures heavily in the determination of rates, it is not by any means the sole factor. Indeed, it is not necessarily, for any given firm at any given point in time, even the most important factor.
- (2) Any attempt at a regulatory determination of asset value is circular for the reasons advanced before: return on investment determines asset value and the regulatory commission is involved in the determination of return.
- (3) The fact that estimated costs, rates of return, and sales volumes are used during ratemaking to determine tariff rates does not automatically convert these estimates into real world facts. It is rare when ratemaking estimates match with experience. A utility that experiences a decline in its costs or an increase in its sales after its rates have gone into effect may very well see an achieved return well in excess of its allowed return, as well as an increase in the market value of its stock, regardless of ratemak-

ing methodologies used. Does this mean that its replacement cost has increased?

- (4) There may be no rate base method which reflects the competitive market any better than any other method. There may be no rate base method which is truly capable of reflecting market prices due to the nature of regulation. However, the price of the regulated firm's stock (and bonds) will reflect market value, and it will take regulatory actions into consideration.

## V. EMPIRICAL WORK

As has been demonstrated, the authors of this paper can find no theoretical merit in the claims that the prices of services regulated under either TOC or DOC behave in any certain way. As we noted earlier, we also analyzed available data on price behavior of regulated oil and gas pipelines to determine if there is any empirical merit to the claims.

The gas pipeline expense, volume, and revenue data were obtained from the Energy Information Administration.<sup>38</sup> Data are published yearly for a composite of major gas pipeline companies. There are no actual reported price data. Individual tariff rates are too complicated to be of any use in computing price statistics and such price data are only relevant for a study such as this. Hence, price data had to be computed for this study via another means. The average transportation price per unit computed for this study is derived, for the years 1979-1988 by subtracting production expense (the expense of obtaining gas supplies which is directly passed onto the customer in rates) from total pipeline operating revenues and dividing by delivered volumes. Delivered volumes include both sales and transportation volumes. Because of timing differences and the presence of storage gas, it cannot be stated for certain that all gas supply costs are completely removed from our estimated price. Also, the length of haul may vary from year to year, which could provide some distortion. However, it is believed that the computed figures accurately reflect pricing trends in the industry and are as accurate as can be developed without considerable additional effort.

The data are further adjusted by the producer price index for finished goods (PPI) to eliminate the effects of inflation. The PPI is used because the Bureau of Labor Statistics computes an index named "Pipelines, except natural gas" in its producer price index series. The results are shown in Table 1.

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38. *Statistics of Interstate Natural Gas Pipeline Companies, 1988*, Energy Information Administration. U.S. Government Printing Office, November 1989.

TABLE 1

YEAR	GAS PIPELINE "PRICE"	PRODUCER PRICE INDEX 1982=100	ADJUSTED OR "REAL" PRICE	OIL PIPELINE INDEX 12/86=100
1988	\$0.268	106.9	\$0.250	94.8
1987	0.302	102.8	0.293	
1986	0.380	100.2	0.379	100.0
1985	0.367	103.2	0.356	
1984	0.394	103.7	0.370	
1983	0.417	101.3	0.411	
1982	0.334	100.0	0.334	
1981	0.274	98.0	0.280	
1980	0.266	89.8	0.299	
1979	0.244	78.7	0.313	

As Table 1 indicates, real gas pipeline transportation prices show no discernable trend over the ten year period. Hence, it is concluded that rates regulated under a DOC regime do not necessarily decline.

As mentioned earlier, the BLS also has a producer price index of oil pipelines. However, as of this writing, BLS personnel have been unable to locate the entire index. It is believed that the first year the series was computed was 1985. As shown in Table 1, the oil pipeline index has declined since December 1986 (the index will be set at "100" at its base year), as has the index we developed for gas pipelines (but not as precipitously for the latter). The yearly change in the oil pipeline index between December 1986 and 1988 is not known at present. As more data become available, the relative behavior of each index can be studied. Evidence can then be developed as to the comparative behavior of industries regulated under each regime.

## VI. FINDINGS

The Trended Original Cost literature to date, for the most part, contains more claims of the advantages of this method than the empirical evidence or theory can support. While it is true that the time path of tariff rates and rates of return are different under TOC and DOC, it is not possible under either methodology to specify the time path of revenues or returns over the life of a project *a priori*. Nevertheless, either methodology can be adopted for ratemaking purposes. No evidence is currently available to determine which is the better method in terms of more closely replicating the competitive market. Indeed, the available evidence suggests that neither appears to have advantages over the other in this regard. Hence, the hypothesis that TOC better replicates the non-regulated, competitive economy must be rejected.

## VII. FURTHER DEVELOPMENTS

In Opinion No. 360, the Commission determined that Buckeye Pipe Line Company, L.P (Buckeye) lacked significant market power in fifteen of the

markets it serves.<sup>39</sup> As a result, the Commission accepted an experimental program in which Buckeye's rates will be set by market forces in those markets in which it lacks significant market power, *i.e.*, monopoly power.<sup>40</sup> Additionally, the Commission determined that Buckeye could exercise market power in four markets and that there was insufficient evidence to determine if Buckeye could exercise market power in one of its markets. The Commission indicated it would determine just and reasonable rates in those latter five markets, but only if the specific markets served the Air Transport Association's (ATA) members (the only shippers represented in the case). However, the Commission did not indicate its preference for a particular rate methodology with regard to non-competitive markets.

### VIII. CONCLUSION

Which ratemaking methodology should be used to set rates in non-competitive oil pipeline markets is an interesting question. TOC was advanced as a methodology which would more nearly replicate competitive markets.<sup>41</sup> However, this paper has shown that this is not the case. Therefore, it could be argued that those markets which are not competitive should receive the same regulatory treatment as gas pipeline transportation markets, in which there is a presumption of significant market power, *i.e.*, regulated by the use of a DOC methodology.<sup>42</sup> This would eliminate the necessity for the Commission to develop an expertise in two separate, distinct ratemaking philosophies. To an economist, this would be efficient.

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39. Buckeye Pipe Line Co., L.P., 53 F.E.R.C. ¶ 61,473, at 62,658 (1990).

40. This use of market forces to regulate is referred to by the Commission as light-handed regulation. See Buckeye Pipe Line Co., 44 F.E.R.C. ¶ 61,066, at 61,182 (1988), *reh'g denied and clarified*, 45 F.E.R.C. ¶ 61,046, at 61,158 (1988).

41. Opinion No. 154-B, *supra* note 6, at 61,834.

42. In fact, this is exactly the end result reached by the Administrative Law Judge in Endicott Pipeline Co., 55 F.E.R.C. ¶ 63,028, at 65,138 (1991). After finding that Endicott Pipeline faced no competition for the transportation of crude oil from the Endicott field, the judge rejected the TOC methodology espoused in Opinion No. 154-B and adopted instead a traditional DOC approach.

