COPING WITH UNDERDEPRECIATION IN THE
ELECTRIC UTILITY INDUSTRY

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The purpose of this study is to examine a two-part hypothesis. The first part is that underdepreciation is the cause of serious financial problems which have beset investor-owned electric utilities in recent years. The second part is that depreciation adjusted for changes in the general level of prices would do much to alleviate these problems.

A financial ratio analysis, primarily of the twenty-four electric utilities that make up Moody’s electric utility average, reveals the nature and magnitude of the utilities’ problems: cash flows inadequate to replace fixed assets, stocks selling below book value, and at least occasional dividend payments out of capital. An examination of the nature of the electric utility industry shows the critical role depreciation plays in the industry’s financial health and why, particularly during periods of inflation, that depreciation is so susceptible to understatement.

By closely probing the concept of depreciation, criteria for what depreciation ought to accomplish are established. Four different methods of measuring depreciation are checked
against these criteria. It is demonstrated that the units of purchasing power-historical cost (UOPP-HC) method best performs the criteria-functions.

The UOPP-HC method of measuring depreciation is then applied to Consumers Power Company of Jackson, Michigan. This yields detailed empirical evidence of serious under-depreciation in this particular electric utility—evidence that particularizes the inferences drawn from the financial ratio analysis of the problems of investor-owned electric utilities in general. It is, in fact, established that what is true for Consumers Power Company specifically is largely true for investor-owned electric utilities generally.

The conclusion is that the investor-owned electric utilities need larger cash flows, if they are to avoid the financial crisis toward which they are headed. UOPP-HC depreciation has much to recommend it as the means of generating these larger cash flows.

The emphasis of this study is on the period 1964 through 1976. An examination of some key financial ratios for the period 1977 through October, 1980 indicates that the plight of the investor-owned electric utilities is probably even more critical in this subsequent period than in the period emphasized. And an examination of some of the highlights, during this subsequent period, in the field of accounting for inflation reveals considerable thought and discussion
that tend to corroborate this study's conclusions and recommendations.
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CHAPTER I

INTRODUCTION

The purpose of this dissertation is to prove the following hypothesis: Underdepreciation is the cause of serious problems which investor-owned electric utilities have encountered in recent years, and depreciation adjusted for changes in the general level of prices would do much to solve these problems.

This first chapter gives the evidence of the problems to which this study is addressed. This evidence indicates that these problems that investor-owned electric utilities face are serious problems.

Chapter II examines the nature of the electric utility industry and explains why the industry is so susceptible to underdepreciation during periods of inflation. It shows that of all the factors casting doubt on the earnings of investor-owned electric utilities, depreciation expense is most plausibly suspect. If, during periods of inflation, depreciation expense is in fact understated, and net income thus overstated, investors and creditors are then justified in downgrading the quality of investor-owned electric utilities' reported income. In short, if net income is overstated because of underdepreciation, there is a solid,
underdepreciation-related basis for the problems cited in
Chapter I.

Evidence of the Problems

Each of the following features of investor-owned
electric utility financing indicates that the investors in,
and the creditors of, investor-owned electric utilities are
skeptical of the reported earnings of these utilities. Each
feature indicates doubt about the quality of these utilities' reported earnings.

Declining Price-Earnings Ratios

Figure 1 shows what happened over the period 1960
through 1976 to the price-earnings ratio of the twenty-four
electric utilities that comprise Moody's utilities average.

Whereas the market attached a value of nearly $21 to each
$1 of earnings in 1961, it attached a value of between $6 and
$7 to each $1 of earnings in 1974. For the most recent year
shown, 1976, the market showed some improvement from the 1974
low, valuing each $1 of electric utility earnings at $7.40.

To determine how much of this higher capitalization rate
was unique to electric utilities over this period, their price-
earnings ratios may be contrasted with the price-earnings
ratios of a broader group of stocks. That is the purpose of
Figure 2.

In Figure 2 the price-earnings ratios of the stocks in
Moody's industrial average (for the period 1960 through 1974)
and of the stocks in Standard and Poor's average of 500 stocks (for the years 1975 and 1976) are contrasted with the price-earnings ratios of Moody's utilities. The ratios for the broader averages are simply superimposed on the same data shown in Figure 1.

The transition that occurred during 1967 is one of the noteworthy features of this comparison. During most of the time prior to 1967, the market attached greater value to $1 of electric utility earnings than to $1 of industrial earnings. After 1967, the market reversed its valuation—attaching greater value to industrial earnings than to electric utility earnings. In 1972, when the divergence was greatest, the market valued $1 of industrial earnings at $17.87 at the same time it valued $1 of electric utility earnings at $10.40. In other words, the market attached about 72 per cent more value to industrial earnings than it did to electric utility earnings.

Clearly, the market was indicating between 1967 and 1976 that the quality of electric utility earnings, both absolutely and relatively, was steadily deteriorating.

Greater Dependence on External Financing

Figure 3 shows the annual percentage distribution of internal and external sources of funds for the period from 1964 through 1976. Over this period, investor-owned electric utilities experienced a significant shift in their sources of funds—toward increasing dependency on external sources. In
Fig. 3--Sources of funds of investor-owned electric utilities, 1964-1976. Source: Edison Electric Institute, as cited in Andrew F. Brimmer, Financing Public Utility Investment Requirements; Edison Electric Institute.
1964, internal sources provided approximately 60 per cent of total funds. External sources provided about 40 per cent. Seven years later, in 1971, internal sources provided only slightly more than 28 per cent of total funds while external sources provided about 72 per cent. Since that low point in 1971, the utilities have experienced moderate improvement in their ability to meet their need for funds internally. Specifically, in 1976, internal sources provided about 31 per cent of total funds while external sources provided about 69 per cent.

Figure 4 provides some detail on what happened to internal sources of funds from 1964 through 1975. Specifically, it shows the percentage contribution the two primary internal sources of funds, depreciation and retained earnings, made to total sources of funds of investor-owned electric utilities.

For the purpose of this study, it is especially noteworthy that depreciation provided about 40 per cent of the total funds used by these utilities in 1964. But in the most recent years, depreciation provided only some 20 to 22 per cent of the total funds.

Retained earnings contributed about 20 per cent in 1964. Then their contribution, like depreciation's, declined by about one half. Thus, in 1975, retained earnings contributed only about 9 per cent of the total funds used by investor-owned electric utilities that year.

Of course fewer funds coming from internal sources necessitated raising more funds from external sources. With
Fig. 4—Depreciation and retained earnings as a percentage of total sources of funds of investor-owned electric utilities, 1964-1975. Source: Edison Electric Institute, as cited in Andrew Brimmer, Financing Public Utility Investment Requirements, 1975; Edison Electric Institute.
such a sizable increase in their reliance on external sources of funds, investor-owned electric utilities not surprisingly relied more heavily on all three major external sources of funds—common stock, preferred stock, and long-term debt.

However, over the period studied, there was a fundamental shift in the relative importance of these three major external sources of funds. During the six years from 1964 through 1969, investor-owned electric utilities got their new external funds, on the average, from common stock, preferred stock, and long-term debt in approximately 1 : 1 : 8 proportions. During the six years from 1970 through 1975, the corresponding ratio was about 2 : 2 : 6.

**Market Value Below Book Value**

Figure 5 shows the market value of investor-owned electric utility common stock as a percentage of the book value of the stock. The data span the same period during which the utilities' new external financing changed from 1 : 1 : 8 proportions for common stock, preferred stock, and long-term debt, respectively, to a 2 : 2 : 6 ratio.

Market values of electric utility common stocks averaged about 220 per cent of book value in 1965. But during the following ten years, market values as a percentage of book values fell steadily and dramatically.

It was in 1973 that the market value of the average investor-owned electric utility common stock fell below book
value. The slide in market value as a percentage of book value bottomed out in 1974 and 1975 when the market value averaged about 60 per cent of book value. This contrasts with the 97 per cent of book value at which Moody's average of utility common stocks sold during the most recent period in which electric utilities' common stock sold below book value. That period was the last half of the 1940's.

In short, at about the same time the electric utilities became more dependent on external sources of funds, they relied relatively more heavily on new issues of common stock. And to market that common stock, they were obliged to sell it at a progressively lower percentage of book value, until they were even selling it at deep discounts from book value. This was particularly unfortunate because to sell stock at less than book value imposes an automatic and self-reinforcing decline on both book value and earnings per share. A simple example may help illustrate this point.

Suppose a firm has $100 of assets. These assets are financed entirely by 10 shares of common stock. Thus, at the outset, the book value per share is $10.

Further assume that the firm earns 10 per cent on its investment. So initially the firm has a total return of $10 on its $100 investment. Because there are 10 shares outstanding, the firm has earnings per share of $1.

Now suppose the firm is, for the first time, obliged to sell stock at below book value. Suppose it sells 2
additional shares of stock at 70 per cent of book value. (Approximately 70 per cent is the most recent market value to book value ratio shown in Figure 5.) The proceeds of the sale are thus $14, i.e., $7 per share.

The firm now has total assets of $114. And the firm now has 12 shares of stock outstanding. It follows that whereas the initial book value per share was $10 ($100 ÷ 10), the book value after the first sale of stock below book value is $9.50 ($114 ÷ 12).

If the firm continues to earn 10 per cent on its investment, its new total earnings will be $11.40. Now earnings per share will be $.95 ($11.40 ÷ 12).

In sum, in this illustration, the sale of 2 additional shares at 70 per cent of book value caused the book value of each of the then outstanding shares to decline from $10 to $9.50 and the earnings per share to decline from $1 to $.95.

Sales of other shares at below book value would cause the book value per share to decline from $9.50. And even if the 10 per cent return on investment is maintained, sales of other shares at below book value would cause the earnings per share to decline from $.95.

Stockholder Actions

The financial press has, in recent years, reported on still other evidence of depreciation-related problems in the investor-owned electric utility industry, viz., stockholder actions. For example, the January 27, 1976 issue of The Wall
Street Journal contained an article titled, "Utah Power and Light Holders May Set a New Trend by Intervention in Electric-Rate Hearing." The following are excerpts from that article:

Regulators, accustomed to hearing customers' protests during electric-rate cases, should prepare to hear from a new group of protesters—utility stockholders.

The first stockholder group to intervene vigorously in an electric-rate case appears to be shareholders of Utah Power and Light Co. Some Wall Street analysts expect similar intervention elsewhere, they said.

Heretofore, consumer groups were just about the only outsiders to intervene in utility-rate proceedings. But today witnesses are to testify in Salt Lake City on behalf of a group of Utah Power and Light stockholders who have intervened in the case.

At one point, the utility's attorney told the board of directors they had a basic conflict in trying to meet their obligations to shareholders and the corporation itself, a spokesman said. On the one hand, the directors had to see to it that the utility met its obligation to supply electricity in its designated service area. That duty is spelled out in its state franchise. To meet anticipated power demands the utility is building more power plants and selling common stock—sometimes below book value—to finance part of the plant construction.

But on the other hand, the directors have an obligation to protect shareholders' interest and past sales below book value weren't good for the stockholders, the spokesman explained. So, the directors formed a stockholders' committee to press shareholders' interests before the regulatory agency.

The essence of the stockholders' case is that Utah's regulators should provide the utility sufficient revenue to earn a big enough profit to assure that common stock will sell above book value. If the regulators won't grant rate rises big enough to supply that much revenue, they should remove the utility's obligation to provide the electricity needs forecast for its service area. Then it won't have to spend more than it can comfortably afford.

In his editorial in the June 12, 1978 edition of Barron's, Robert Bleiberg gives other examples of electric utility
The title of the editorial is "Forgotten Man: The Climate May Be Turning More Hospitable to Investors."

The following are excerpts from that article:

Believe it or not, the times they are a changin', in small ways and large. On the first count, consider the way in which organizations of militant utility shareholders have abruptly mushroomed. Within the past two years or so—one only in mid-January—such bodies as the Association of Detroit Edison Shareholders, the Ohio Association of Utility Investors and the California Association of Utility Shareholders have sprung up. Moreover, unlike so many of their hopeful but hapless predecessors, they are more than paper tigers. In barely six months, the Detroit Edison group (open to anyone who owns one share of stock, and funded by co-owners at the rate of five cents per share) has hired an accountant, lawyer and public relations firm, as well as a full-time researcher. Membership in other bodies now runs into the respectable four figures.

As to what they have achieved, it's far too soon to look too hard at the bottom line. Yet within the limits of their resources—"we have been as active," one engagingly claims, "as our personnel and finances permit"—they already have made themselves heard and felt.

Yield Spread Between Electric Utility and United States Treasury Bonds

Evidence of doubt about the quality of investor-owned electric utilities' earnings is not limited to these utilities' equity securities. Doubt also shows up in the utilities' debt securities.

Figure 6 shows the weighted average yields on newly issued light, power, and gas bonds each year for the period 1960 through 1976. Over this period, the yield on these utilities' bonds nearly doubled. From 4.7 per cent in 1960,
the yield rose to nearly 10 per cent in 1975. It then retreated to 8.9 per cent in 1976.

Figure 6 also shows the yields on taxable United States Treasury bonds over this same period. These yields serve a benchmark function. The spread between the utilities' bond yields and the Treasury bond yields (shown by the vertical distance between the two curves in the figure) measures the risk premium the utilities had to pay over this period to float their bonds.

From 1960 to 1965, the spread averaged about 50 basis points. However, the risk premium steadily widened between 1965 and 1970. Since 1970, there has been a fairly steady differential of about 200 basis points. Clearly, the market is indicating that the utilities' bonds have not been, either absolutely or relatively, the quality of investment since 1965 that they were prior to 1965.

Changes in Bond Ratings

The ratings that the major rating services, Moody's and Standard and Poor's, give the electric utilities' long-term debt are useful comprehensive indicators of the quality of that debt. Changes in those ratings reflect changes in the overall quality of the debt. Higher ratings indicate an improvement; lower ratings indicate a deterioration.

Figure 7 shows, by year, the number of electric utility companies whose bonds Moody's gave a higher rating and the number of companies whose bonds this rating agency gave a
Fig. 7—Changes in bond ratings of electric utilities, 1965-1976. Source Moody's Bond Survey, 1965-1976.
lower rating over the period 1965 through 1976. There were between three and four times as many downgradings as upgradings during this period. In 1974, Moody's lowered its ratings of the bonds of thirty-one companies, an extraordinary action. It is clear from this broad measure also that the investor-owned electric utilities had a problem.

**Summary of Evidence of the Problems**

In the period covered by this study, investors became disenchanted with equity investments in electric utilities. While a little over a decade ago they were willing to pay twenty times earnings or more for electric utility common stocks, in recent years they have been willing to pay only from seven to eight times earnings. And although investors became disenchanted with equity investments generally over this period, they were still willing to pay eleven to twelve times earnings for industrial stocks at the same time they paid seven to eight times earnings for electric utility stocks.

In 1965, internal sources of funds provided over 60 per cent of the total financing requirements of investor-owned electric utilities. By 1970, internal sources provided only 30 per cent of total funds. Specifically, depreciation, on which this study focuses, contributed 40 per cent of total financing in 1965 but only 20 to 22 per cent in the first half of the 1970's.
At the same time the utilities became more dependent on external financing generally, they also became relatively more dependent on common stock financing specifically. In the mid-1960's, they could market common stock at more than twice its book value. By the mid-1970's, electric utilities could get only 60 to 70 per cent of book value for their shares.

With new stock being sold at less than book value, old stockholders saw their interests being diluted. For this and other reasons, they became disgruntled in the 1970's. They were so disgruntled in some cases that they formed organizations through which they sought redress for their grievances. Untraditionally, some investor-owned electric utility stockholders became activists.

There was evidence of problems in the debt securities of investor-owned electric utilities as well as in their equity securities.

In the early and mid-1960's, the electric and gas utilities paid about a half per cent higher interest rate on their bonds than the United States Treasury paid on its long-term debt. From 1970 on, the electric and gas utilities have been obliged to pay about a 2 per cent higher interest rate than the United States Treasury.

Although bond ratings are specifically an indicator of the quality of bonds, they are, in effect, a measure of the quality of the issuing corporation as a whole as well. Over
the period 1965 to 1976, one major bond-rating service, Moody's, downgraded between three and four times as many investor-owned electric utilities as it upgraded.

The evidence is clear. The investor-owned electric utility industry is not the industry it once was. In the period covered by this study, the industry suffered significant financial deterioration.

The purpose of Chapter II is to show that underdepreciation has been a major cause of the problems described in Chapter I. Basically this will be done by examining the nature of the electric utility industry—focusing particularly on the critical role depreciation plays in this industry and explaining why during the past fifteen years or so electric utility depreciation has been so susceptible to being understated.
CHAPTER II
THE NATURE OF THE ELECTRIC UTILITY INDUSTRY--AND SOME IMPLICATIONS

To appreciate fully the hypothesis which is the basis for this study, it is necessary to have some basic understanding of the electric utility industry. The purpose of this chapter is (1) to point out and explain features of the industry that are pertinent to this study and, more importantly, (2) to show how these industry features cause the industry to be susceptible, especially during periods of inflation, to underdepreciation.

Demand

Figure 8 shows total electricity sales to ultimate consumers over the period 1956 through 1976. With but one exception, 1973, sales each year were greater than the sales of the previous year. Compared to the demand for the output of other industries, the demand for the output of the electric utility industry shows remarkably steady growth. Thus, a declining demand for its output or a capricious demand for its output--two of the bigger problems many industries face--are two problems the electric utility industry does not have.

Although not so obvious from the figure, the electricity sales data shown in the figure reveal, upon close examination,
a noteworthy trend. Over the entire twenty-year period, 1956 through 1976, electricity sales increased at an average annual compound rate of between 6 and 7 per cent. For the ten years from 1966 through 1976, the average annual growth rate was a bit under 6 per cent. For the most recent five-year period, 1971 through 1976, the average annual growth in electricity sales was slightly less than 5 per cent.

This declining growth rate is probably attributable to price elasticity and conservation. The point, however, for the purpose of this study is that a decrease in the rate of increase in the demand for electricity should, in itself, provide some relief to the industry. Had the demand for electricity risen in the last five- and ten-year periods at the same rate that it increased over the entire twenty-year period, the evidence cited in Chapter I would probably have revealed even more severe problems because the industry would have required even more financing that it actually required.

Satisfying Demand

Figure 9 shows the sources from which the demand for electricity in the United States is supplied. This figure shows the five ownership segments of the total electric utility industry: (1) REA-financed cooperatively-owned electric utilities, (2) investor-owned electric utilities, (3) municipal systems, (4) federal agencies, and (5) state projects and public power projects.
Fig. 9--United States sources of electric generation by type of ownership. Source: Edison Electric Institute, Statistical Yearbook, 1975, p. vi.
The purpose of Figure 10 is to show the percentage of the total electric utility industry installed generating capacity that each of these five ownership segments of the industry had in 1975. Clearly, it is investor-owned electric utility companies that satisfy the bulk, nearly 80 per cent, of the steadily increasing demand for electricity. This study focuses on the investor-owned electric utilities that dominate the total electric utility industry.

Capital Requirements

"The electric utility industry has the highest ratio of investment to revenue of any sector of the industrial economy."\(^1\) Two illustrations may help give perspective on the amount of capital investor-owned electric utilities require to meet the nearly 80 per cent of the total demand for electricity that they satisfy.

Related to Capital Outlays by All United States Industry

Part A of Figure 11 contrasts the annual dollar amounts of capital outlays by investor-owned electric utilities from 1964 through 1976 with the annual dollar amounts of capital outlays by all United States industries over this same period.

\(^1\)"Agriculture has a higher ratio of investment to revenue than any industry, due to the dominance of land, a non-depreciable asset, in its investment total." Murray L. Weidenbaum, Financing the Electric Utility Industry, Edison Electric Institute, 1974, p. 64.
Fig. 10—Percentage of total electric utility industry capacity by ownership segments, 1975. Source: Murray Weidenbaum, *Financing the Electric Utility Industry*, Edison Electric Institute, 1974, p. 25.
Part B of the figure shows investor-owned electric utility capital outlays as a percentage of total United States industry capital outlays.

From a low, but still considerable, 7.5 per cent of all capital outlays by United States industry in 1964, the utilities increased their capital outlays to the point where they represented a little over 15 per cent of all capital outlays in 1972. Since 1972, the proportion of investor-owned electric utility capital outlays to all industry capital outlays has declined moderately.

Related to Personal Savings

It is also instructive to relate new capital requirements of investor-owned electric utilities to personal savings. Figure 12 shows this relationship each year for the period 1956 through 1975. It shows that for each $100 people saved in 1956, they invested about $7.50 in the stocks and bonds of investor-owned electric utilities. For each $100 people saved in 1975, they invested nearly $15 in the electric utilities' securities.

The rate at which investor-owned electric utilities absorbed personal savings to meet their new capital requirements over this period fluctuated quite widely. That absorption rate ranged from just under 5 per cent (in 1965) to over 17 per cent (in 1972). However, the trend is unmistakable. The trend is for these utilities to absorb an
Per Cent

1956 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75

increasing percentage of all personal savings. This is one of the manifestations of the investor-owned electric utilities' increasing dependence, as explained in Chapter I, on external sources of funds.

In sum, these two comparisons—capital outlays of investor-owned electric utilities compared to the capital outlays of all United States industries and new capital requirements of investor-owned electric utilities compared to total personal saving—conclusively illustrate (1) that investor-owned electric utilities require huge amounts of capital and (2) that, over the period studied, these utilities persistently required ever-larger amounts of capital. Keep in mind that these were these utilities' capital requirements during a period when the rate of increase in the demand for electricity was declining.

**Capital Intensity**

By comparing the asset-revenue ratio of the electric utility industry to the asset-revenue ratios of other industries, the capital intensity of the electric utility industry is made readily apparent. Table I shows these ratios for a number of major industries.

Electric utilities require nearly $4 in assets to generate $1 in revenues. Put another way, electric utilities require over 40 per cent more assets than the next most capital-intensive industry, communications, to generate the
same revenues. To make a specific comparison, a company such as Consumers Power must invest nearly seven times as much in assets as a company such as General Motors to produce the same dollar sales.

**TABLE I**

**ASSET-REVENUE RATIOS FOR VARIOUS INDUSTRIES, 1972**

<table>
<thead>
<tr>
<th>Industrial Groups</th>
<th>Asset-Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric Utilities</td>
<td>3.97</td>
</tr>
<tr>
<td>Communications</td>
<td>2.75</td>
</tr>
<tr>
<td>Railroads</td>
<td>2.67</td>
</tr>
<tr>
<td>Investor-Owned Gas Utilities and Pipeline Industry</td>
<td>2.00</td>
</tr>
<tr>
<td>Primary Iron and Steel</td>
<td>0.98</td>
</tr>
<tr>
<td>Chemicals and Allied Products</td>
<td>0.86</td>
</tr>
<tr>
<td>Tobacco Manufactures</td>
<td>0.75</td>
</tr>
<tr>
<td>Motor Vehicles and Equipment</td>
<td>0.58</td>
</tr>
<tr>
<td>Food and Kindred Products</td>
<td>0.44</td>
</tr>
<tr>
<td>All Manufacturing Corporations</td>
<td>0.75</td>
</tr>
</tbody>
</table>


Of course the huge amounts of capital that electric utilities require take a particular form. The following section examines how the electric utilities deploy their capital.
Technology

Of each $14 of capital the electric utilities require, about $13 go to finance fixed assets and approximately $1 goes to finance current assets. Thus, it is the fixed assets that warrant special attention in the course of probing more deeply into the problems with which investor-owned electric utilities are confronted.

The technology of the industry determines what form the fixed assets take. There are three basic categories of fixed assets based on function: (1) production, (2) transmission, and (3) distribution.

Production assets include boiler plant equipment, turbo-generators, and other equipment used to convert the energy in fuel to electrical energy. Transmission assets are the step-up transformers, towers, and other equipment required to carry electricity from the point where production assets generate it to the general area where the utility's customers use it. Distribution assets include the transformers, poles, and other equipment used to deliver the electricity right to the customers' premises in the form they can use it.

Figure 13 shows the breakdown of the electric utilities' fixed assets graphically. The investment in the three major functional categories of fixed assets—production, transmission, and distribution—is roughly in the ratio of 4 : 1 : 2.

One feature which all of these fixed assets have in common, and which feature is especially pertinent to this
study, is their long lives. For example, to use some of the specific assets already mentioned, turbogenerators have an average service life of thirty-seven years, towers sixty-two years, and transformers thirty-four years.

Fig. 13—Breakdown by function of electric utilities' fixed assets.

Capital and Capital-Related Costs

To get another perspective on the technology-dictated capital intensity of the investor-owned electric utility industry, it is useful to study what portion of each revenue dollar the industry pays out for capital and capital-related costs. Figure 14 shows this information graphically.

Combined, the reported capital and capital-related costs absorb about $.42 of each $1 of revenue. Of course, if any of
Interest on Long-Term Debt
Depreciation and Depletion
Dividends on Common Stock
Maintenance
Allowance for Funds-Construction
Retained Earnings
Dividends on Preferred Stock
Interest on Short-Term Debt

Fig. 14—Investor-owned electric utility capital and capital-related costs as a percentage of revenues, 1975. Source: Based on data from Edison Electric Institute Statistical Yearbook, 1978, p. 59.
these reported costs are understated, a still higher percentage of each $1 of revenue should be going to pay these utilities' true capital costs.

Some of the costs, e.g., interest on long-term debt and the dividends on preferred stock, are explicit, contractual obligations. Because such costs are clear-cut and regularly out-in-the-open, there is little chance that utility managers, regulators, or customers would slight them. If for any reason they did slight these costs, they would promptly suffer the consequences. That prompt suffering would lead, if at all possible, to speedy remedial action.

However, others of these capital and capital-related costs, especially depreciation, maintenance, and retained earnings, are not explicit, contractual obligations. Particularly during periods of inflation, these costs may follow a very different neglect-consequences-remedy pattern. When this second category of costs applies to assets with long lives especially, utility managers, regulators, and customers run the risk of failing fully to appreciate them. Failing fully to appreciate them, they might slight them. But whether they slight them unwittingly, from expediency, or for any other reason, the results are the same—very serious.

Some of the major financial results were chronicled in Chapter I. In time, the real results could be more brownouts and more blackouts for electricity consumers. As New York
City's July, 1977 blackout experience illustrates, the economic and social costs of interruptions in the supply of electricity can be immense.

One observer of this phenomenon, that some costs are obvious and clear-cut and some costs are not so obvious or so clear-cut, succinctly described the phenomenon this way: "The people can understand paying for the labor but they can't understand paying for the capital."\(^2\)

It is human nature to be predisposed toward the present rather than the future, the concrete rather than the abstract. Virtually all people desire to avoid pain and costs. So if a firm has two categories of costs--(1) costs that are relatively more concrete and that must be dealt with in the present and (2) costs that are relatively more abstract and that are for a time postponable--it would be quite natural for people to succumb to the temptation to slight the second category of that firm's costs. Depreciation is definitely in the second category of costs. Thus, it is not surprising that the evidence, cited in Chapter I, of investor-owned electric utilities' problems is linked to underdepreciation.

**Technology and Lower Prices**

The cost reduction claims made for electric utility technology are another aspect of that technology that warrant

a review. Figure 15 shows how the price of electricity over the period 1956 to 1976 compared to the prices of consumer goods generally. The outstanding feature of this comparison is that over the period 1956 to 1976 the price of electricity rose significantly less than the prices of all consumer goods. In fact, in 1964 and 1965, the price of electricity actually declined. In 1966, 1967, and 1968, the price remained practically constant.

Some industry analysts have asserted that technological advances in electricity over this period account for the electric utilities' ability to hold down their selling prices. "Until recently, it has been technological improvements that have generated the productivity to offset rising operating costs and thus avoid rate increases." But surely there were technological advances in the other consumer goods industries over this period too. Because of those advances the prices of consumer goods, although they rose considerably, rose less than they would have had there been fewer or no technological improvements. Presumably the industry analysts mean that the electric utility industry made relatively greater technological progress than other consumer goods industries made. However, it is difficult, perhaps impossible, precisely to determine just how much of the electric utility industry's ability to contain its costs, and thus its selling prices, is

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Index
(1956 = 100)

Consumer Prices

Electricity

due to relatively greater technological advances in that industry than in consumer goods industries generally.

The precise role of technological improvements in holding down the costs and the selling prices of electricity relative to the costs and the selling prices of consumer goods generally may be indeterminant. But the fact remains that the salient feature of the comparison in Figure 15 is that the price of electricity rose significantly less than the price of consumer goods generally over the two decades shown. The price of electricity rose so much less that it raises these questions: (1) Is it possible that the selling price of electricity over the period from 1956 through 1976 did not reflect the full cost of providing that electricity? (2) Is it possible that the creditors and owners of investor-owned electric utilities "paid" some of the costs via their losses—-even more in real terms than in the nominal terms shown in the evidence introduced in Chapter I?

Perhaps the technological explanation that is given for the price pattern shown in Figure 15 is too glib an explanation. Perhaps technological advances are simply a partial, an incomplete explanation for the difference in the price of electricity and the price of consumer goods generally. Maybe more has been claimed for electric utility technology's cost containment than is justified. Perhaps having the technological explanation so handy reduced incentive to look further
and deeper for the reasons the price of electricity rose significantly less than consumer prices generally.

The evidence cited in Chapter I indicates that the selling price of electricity for the period from about 1965 through 1976 might not have reflected the full cost of electricity. Specifically, consider depreciation and retained earnings, as shown in Figure 4.

Depreciation and retained earnings are costs. If electricity consumers expect reliable electric service both in the present and in the future, they should expect to pay these costs--fully to pay these costs. Present and future consumers should expect to compensate present and future investor-owned electric utility creditors and stockholders as adequately as past consumers compensated past creditors and stockholders when the consumers received reliable service.

But as the data in Figure 4 show, depreciation and retained earnings did not perform in 1976 the roles they performed in 1964. The roles of both depreciation and retained earnings declined significantly. In other words, these two costs, depreciation and retained earnings, declined relative to the funds required to maintain reliable electric service. In short, relative to the funds required to maintain reliable electric service, these costs were lower in 1976 than they were in 1964.

Had these costs between 1964 and 1976 maintained the same relationship to the funds required to provide reliable
electric service that they had in 1964, selling prices over the period 1964 through 1976 would have had to have been higher. And in that case, some, perhaps much, of the difference between the price of electricity and the price of consumer goods generally shown in Figure 15 would have been eliminated.

But the revenues that would have preserved the historic relationship of depreciation and retained earnings to funds necessary to maintain reliable electric service were not forthcoming. Since the revenues that should have been forthcoming were not forthcoming, it seems logical to expect some of the suppliers of inputs into the investor-owned electric utility industry to suffer. The evidence cited in Chapter I shows that the expected results were the actual results. More specifically, the evidence cited in Chapter I seems nicely to fit the thesis that investor-owned electric utility creditors and stockholders were not getting their due over the period 1964 through 1976. Still more specifically, over the period 1964 through 1976, it appears that investor-owned electric utilities understated their depreciation expense. It appears that these utilities did not fully recover the resources financed by their creditors and stockholders.

Surely the consuming public's initial impulse is to applaud the fact that the price of electricity has not risen as much as consumer prices generally. But there are some who have sounded warnings that may properly give the electricity
consumer reason to restrain his applause, if not to refrain from applauding this price pattern altogether. For example, in its 1952 report to the National Association of Railroad and Utility Commissioners, the Committee on Corporate Finance issued this warning:

Over the long term, obtaining and retaining prime credit rating for the utilities is far more important to the public than the continuance of utility rates which are depressed in relation to present wages, incomes and general prices.4

Regulation

Although the exact role that technology plays in holding down the price of electricity is inconclusive, technology has another impact on the electric utility industry that is quite decisive.

The technology of electricity is such that electric utilities are natural monopolies. The producer of electricity, to have the lowest possible costs per kilowatt-hour, must produce, transmit, and distribute the electricity in very large quantities. If the producer is to sell these large quantities of electricity profitably, he must typically sell to virtually all of the consumers of electricity in a given area. So efficiency dictates monopoly. Then state and federal regulation, it is argued, is necessary to insure that consumers get the benefits of competition, viz., pressure to

allocate resources in accordance with consumer preferences and to adopt the most efficient productive techniques so that selling prices will tend to equal marginal costs and minimum average costs, in this monopoly situation.

What does it mean for a firm to be regulated?

Regulated firms have rights and duties, usually as follows:

Rights. (1) They are entitled to "reasonable" prices and profits. (2) They are given complete or partial protection from competition (via a franchise). (3) They can exercise eminent domain in acquiring property, even by coercion. (4) Rules governing them must be reasonable.

Duties. (1) Prices and profits are to be no more than "reasonable." (2) At those prices, all demand must be met, even at peak times. Service must be adequate in quantity and quality. (3) All changes in services (adding or dropping them) must be approved in advance. (4) The safety of the public is to be protected.  

An Analogy

Figure 16 shows a critical difference, especially critical for this study, between a non-regulated firm and a regulated firm.

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The non-regulated firm is analogous to a single driver at a red light. When the red light changes to green, the driver simply goes. Only he has to interpret the signal correctly. Only he has to respond. If the driver is alert, there is little or no lag in the process.

The regulated firm is analogous to a driver who is last in a line of a number of drivers stopped at a red light. When the red light changes to green, the last driver can go only after all of the drivers ahead of him go. All of the intervening drivers must first interpret the signal correctly. All of the intervening drivers must first respond. Inevitably there is a lag.

The managers of investor-owned electric utilities, no matter how alert they are, cannot unilaterally decide to pass higher costs on to their customers. They cannot unilaterally decide what is a "reasonable" return on their investment—or even what their investment is. Regulated utilities surrender these and other what in non-regulated industries are traditionally considered management prerogatives.

The Experts on Regulation

The following three capsule views of regulation indicate doubt about the efficacy of regulation under the best of circumstances.

George J. Stigler, Leading theorist and "Chicago" expert on industrial organization since 1957, has pressed the view that regulation is empty and/or harmful.
Paul W. MacAvoy of MIT suggests from research that the regulation of natural gas, railroads, and electricity has been unnecessary and costly.

Alfred E. Kahn, a leading scholar of regulation, urges that regulation, though imperfect, is workable and often effective.6

But during roughly the last ten years covered by this study, the investor-owned electric utilities' circumstances have been particularly trying. These utilities have been faced with many changes and with rapid changes. They have simultaneously had to deal with OPEC-dictated higher fuel costs, increasing public concern about the dangers of nuclear power, more stringent pollution control legislation, and inflation. It is inflation that is especially germane to this study.

The lag inherent in the regulatory process becomes particularly serious during periods of change. The more changes and the more rapid the changes, the more serious this defect in the regulatory process becomes. In such an environment, the more people who must "see the light" in any neglect-consequences-remedy sequence, the more vulnerable is the firm that depends on those people.

**Regulation is Political**

In any assessment of regulation, it is important to keep in mind that regulatory agencies are political bodies. No

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matter how able the people who staff them, no matter how fair-minded these people may be, the agencies on which they sit are still political entities. This is one of the results that bears on this study:

Utility rates, affecting nearly all customers, naturally have high visibility. When they appear to be moving upward at a rapid clip, requests for increases almost automatically generate consumer and political opposition. Facing rising utility bills, and not fully comprehending the reasons, the consumer often feels victimized. So he protests to the one governmental body entrusted with protecting the public interest, the regulatory agency. The commissioners, whether appointed or elected, are in the political spotlight. In their unenviable jobs, they are often subject to heavy pressures in deciding the merits of a utility rate increase request.\(^7\)

Perhaps the key phrase in this quotation is, "not fully comprehending the reasons," referring to utility customers.

To the extent that members of regulatory agencies are responsive to consumers, it is those consumers who must "see the light" on issues with which the regulatory agencies deal. So the management of regulated industries is up against another layer of impedimenta, the customers themselves. It follows that management is thus confronted with a still bigger education job and a still greater potential lag between the time something happens in the regulated utilities' environment to which management ought to respond and the time that the utilities' management is able actually to respond.

In sum, it is not sufficient for utility managers to understand the needs of the utilities they manage. Since electric utilities are regulated, it is also necessary for the regulators to understand the needs of the utilities they regulate. But because regulation is political, it is not sufficient that the regulators understand the needs of the utilities they regulate. For both the short-run and long-run well-being of the investor-owned electric utility industry, the regulators' constituents must also understand what the industry requires to provide reliable electric service. The more changes and the more rapid the changes that electric utilities encounter, the more likely it is that the regulators' constituents will not have this understanding. Thus during periods of change, and especially during periods of rapid change, the investor-owned electric utilities are vulnerable.

Investor-owned electric utilities actually encountered many changes and rapid changes during the period covered by this study. It seems quite possible that (1) even utility managers may not have clearly, completely appreciated the implications of these changes for the utilities they manage; (2) regulators, as a group, may have recognized still fewer of the implications; and finally, and this seems especially likely, (3) members of the electricity-consuming public who put pressure on the regulators may have understood even fewer of the ramifications of the changes than the regulators.
Under these circumstances, it would seem reasonable that there might be, during the period covered by this study, some rearranging of the traditional relationships of the owners, creditors, employees, suppliers, and customers of the investor-owned electric utility industry. One possible rearrangement is the shunting of some of the generation, transmission, and distribution costs traditionally borne by customers onto owners and creditors. The evidence cited in Chapter I suggests that this possible rearrangement was the salient actual rearrangement during the period covered by this study.

The evidence cited in Chapter I appears to fit the hypothesis that historical-cost depreciation was the vehicle for this plausible rearrangement, viz., the shunting of costs traditionally borne by consumers onto owners and creditors. Utility managers, regulators, and even many electric utility customers are familiar with historical-cost depreciation. Historical-cost depreciation is objective, at least in some respects. All along, historical-cost depreciation provided nominal evidence that there was no rearranging of the traditional relationship of owners and creditors to customers. But the nominal evidence was deceptive.

As subsequent chapters of this study will show, it would have required abstract, relatively novel accounting practices to have prevented the real rearrangement. Given the political nature of regulation, it is not surprising that these accounting
practices have not been generally approved by the agencies that regulate investor-owned electric utilities.

Other Features

At this point it may be useful to examine several other features of investor-owned electric utilities which are particularly relevant to this study.

Rate Making

Rate making is at the heart of the on-going regulation to which electric utilities are subject.

Public utility rate making under regulation follows two basic steps: first, the utility's cost of service under prudent management is determined; second, the utility is authorized to charge for its services under schedules of rates which, on an anticipated volume of business, will produce total revenues about equal to the cost of service... The cost of service is the sum of: (a) operating expenses, (b) depreciation expense, (c) taxes, and (d) a reasonable return on the net valuation of the property devoted to the public service. The total net value of the company's tangible and intangible capital is called the "rate base" or the valuation for rate-making purposes. 8

Of the components of the cost of service, this study focuses on (b), depreciation expense. This component is, of course, closely entwined with component (d), "a reasonable return on the net valuation of the property devoted to the public service," because (1) a "reasonable return" exists only after adequate depreciation has been allowed for and (2) "net valuation" means depreciated valuation.

A utility and the agency that regulates it may disagree on what the utility's cost of service is. They may, for example, disagree on what is the correct depreciation expense for a given accounting period or on what the net value of the property in service is. Thus, they will disagree on what rates the utility should charge its customers.

If the regulatory agency denies the utility's rate requests,

... the utility may choose to petition the courts under due process of law. The court will then decide whether the service rates are just and reasonable, unreasonable, or confiscatory. If rates are found to be unreasonable or confiscatory, the case will be remanded back to the commission for redetermination.

Thus court cases become primary guides to investor-owned electric utilities. For example, court cases are guides as to what costs our judicial system, the ultimate arbiter, will permit an investor-owned electric utility to treat as costs of service. Specifically, court cases serve as guides as to what return on investment is a "reasonable" return. It follows from this that court cases are guides as to what rates investor-owned electric utilities can charge.

_Federal Power Commission v. Hope Natural Gas Co. (1944)_ is probably the landmark case for all regulated utilities. In that case, the United States Supreme Court ruled that

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10 320 U. S. 591, 51 PUR NS 193, 88 L Ed. 333.
there is no single method for determining just and reasonable rates. Rather the court concluded, it is the end result of ratemaking that determines justness and reasonableness. In addition, the court laid down these criteria: (1) that the return to the equity owner should be commensurate with returns on investments in other enterprises having corresponding risks; and (2) that the return should be sufficient to ensure confidence in the financial integrity of enterprise so it could maintain its credit and attract capital. These guidelines are generally expressed in terms of a fair return on invested rate base.11

Dividend-Payout Ratio

Another feature of investor-owned electric utilities especially pertinent to this study is their dividend-payout ratio. Although this feature might be inferred from some of the evidence cited in Chapter I, viz., the evidence pertaining to these utilities' great dependence on external sources of funds and the data shown in Figure 4 pertaining to retained earnings, it warrants explicit consideration.

Over the decade 1968 through 1977, investor-owned electric utilities paid out in cash dividends to their common stockholders an average of 67 per cent of the income reported as available for the common stock. The annual payout ratio was in a very narrow range from 65 per cent to 69 per cent.12

This relatively high dividend-payout ratio means, of course, that investor-owned electric utilities retain a relatively low percentage of their total earnings. In other words,


12Based on data from Edison Electric Institute Statistical Year Book, 1975 and 1977, p. 61.
they do not generally rely greatly on retained earnings to finance their huge capital requirements. Instead, they traditionally rely heavily on frequent, new external financing. So it is vital that they continuously remain attractive to creditors and investors.

Coping with Current Problems

The purpose of this section is to examine how, in view of the nature of the industry, the industry has coped with two of the major problems it has encountered in recent years. Those two problems are higher fuel costs and inflation.

Higher Fuel Costs

Fuel is the basic "raw material" of the electric utility industry. Figure 17 shows what happened, from 1965 to 1976, to the cost of the three primary fuels that electric utilities use.

The cost of all three fuels—oil, natural gas, and coal—remained fairly stable during the last half of the 1960's. But then in the first half of the 1970's, the cost of all three fuels skyrocketed. The rise in the price of oil was especially large. This was due to the actions of a cartel, the Organization of Petroleum Exporting Countries (OPEC).

There is nothing subtle about this problem. A utility's cost of fuel is as explicit, as out-in-the-open, as a cost can be. As a result, many electric utility managers have sought and many regulators have approved of automatic fuel
adjustment clauses. In 1974 such fuel adjustment clauses covered about three-fourths of all investor-owned utility kilowatt-hour sales to ultimate customers. Via these automatic fuel adjustment clauses, higher fuel costs are passed on to consumers in higher rates for electricity fairly quickly. These clauses reduce the lag in the utilities' recovering this particular component of their costs of generating electricity. But they do not completely eliminate the lag. Because of the normal lag between billing and collecting, utilities with automatic fuel adjustment clauses may still experience a strain on their working capital whenever fuel costs rise rapidly. And although consumers may not like paying higher rates because of higher fuel costs, they clearly understand why they are paying the higher rates.

All-in-all, after a sometimes trying transitional period, the industry, regulators, and consumers are now relatively well acclimated to higher fuel costs. The industry and regulators have built into much of the system a mechanism for dealing reasonably well with future changes in fuel costs.

**Inflation**

During the same 1965 through 1976 period that fuel prices rose as shown in Figure 17, there was inflation in the United States. Using the Gross National Product (GNP) implicit price deflator as the measure, the data in Figure 18 show, by year, just how much inflation there was.
Fig. 18—GNP implicit price deflator, 1965-1976. Source: 1976 Business Statistics, United States Department of Commerce.
The price of fuel rose more than prices generally because the price of fuel was determined in part by inflation and in part by factors other than inflation, particularly OPEC, as mentioned in the preceding section on higher fuel prices. Still, even the increase in prices generally was clearly consequential. And prices generally rose quite rapidly, by modern United States standards. As this examination in Chapter II of the nature of the industry reveals, it is to rapidly rising nonexplicit, noncontractual costs that the industry is especially vulnerable.

Depreciation is the major nonexplicit, noncontractual cost of the electric utility industry. Depreciation is not a cash outlay. For these reasons, it is relatively much easier to slight depreciation than to slight most of the electric utility industry's other costs. Because electric utilities have such large investments in depreciable property, to slight depreciation is to make a serious error. It thus seems prudent to focus on investor-owned electric utility depreciation, as this study does.

Utility managers must pay their fuel suppliers with cash. These managers pay for both fuel and labor frequently. During periods of inflation, the purchasing power of a given amount of cash falls. The fuel suppliers and employees know this. They promptly seek relief, i.e., fuel suppliers and employees simply require more cash for a given amount of fuel and labor. The fuel suppliers who are members of OPEC have been able to
exact from United States electric utilities and others even more cash than is necessary to preserve the purchasing power they get in exchange for a given amount of their oil.

But the nexus between the creditors and stockholders who, in effect, supply the utilities' plant and equipment and the payment for those factors of production is not nearly as tight and direct as it is for the suppliers of fuel and labor. In theory, depreciation is supposed to recover what capital suppliers put into a business. However, given present practices, depreciation recovers the amount of cash that capital suppliers put into a business. But when during periods of inflation the purchasing power of that cash falls, the plant and equipment suppliers, unlike fuel suppliers and employees, are not in a very good position promptly to get relief in the form of more cash for a given amount of plant and equipment.

To be precise, it is only existing electric utility creditors and stockholders who are in a poor position to get relief in the form of more cash during periods of inflation in exchange for providing a given quantity of plant and equipment. The securities market, if unhampered, is remarkably accommodating. Through the securities market, new creditors and stockholders can indicate their higher interest rate requirements and higher capitalization rate requirements even faster than fuel suppliers and laborers can impose their requirements for more cash. It is precisely an accommodating,
an adjusting securities market that the bulk of the evidence cited in Chapter I chronicles.

But the fact that new creditors and new stockholders can practically continuously renegotiate the terms on which they will, in effect, supply the plant and equipment for electric utilities provides no relief to old creditors and old stockholders. Given the present nature of the investor-owned electric utility industry—especially its being subject to sluggish, political regulation—and present practices of the investor-owned electric utility industry—such as the industry's using historical-cost depreciation—one group after another of creditors and stockholders has been caught in transitions. This section of Chapter II focuses on the especially critical transitions from one rate of inflation to another higher-than-anticipated rate of inflation. The holders of debt and equity securities during these transitions have, in many cases, suffered real losses. If the supplier of any factor of production for any industry gets "burned" repeatedly, that supplier is likely to become progressively less inclined and perhaps ultimately even disinclined to be a supplier of that factor to that industry. Just as it is vital that electric utilities promptly recover their fuel costs and their labor costs, so it is vital that they promptly recover all of their other costs. Those other costs certainly include the sizable cost of fixed assets
consumed--on which this study focuses but with which, it is the hypothesis of this study, the industry is coping badly.

Summary

To satisfy about 80 per cent of the ever-greater demand for electricity, investor-owned electric utilities require huge amounts of capital. The bulk of this capital must be invested in fixed assets, typically with very long average lives. A sizable portion of the attendant costs of these long-lived fixed assets, viz., depreciation, maintenance, and retained earnings, are not explicit, contractual obligations. Because these costs are not explicit or contractual, it is relatively more difficult to appreciate them than costs such as fuel and labor which are explicit and contractual.

The investor-owned electric utilities are subject to continuous regulation, primarily by state regulatory agencies. Rate-making--settling on the prices that the utilities can charge for the electricity they produce, transmit, and distribute--is at the heart of this regulation. Basically, the regulatory agencies permit the utilities to charge rates that will produce total revenues about equal to total costs. Of course, total costs include the nonexplicit, noncontractual depreciation expense on which this study focuses.

The members of the regulatory commissions must be "sold" on what the utilities' depreciation expenses, and all other expenses are. Further, since the regulatory agencies are political bodies, the members of the regulatory commissions are
subject to considerable pressure from their constituents. Since the electricity-consuming constituents are far more numerous than the electricity-producing constituents, most of the pressure from constituents is in the direction of lower rates, which is tantamount to lower costs. Thus, practically, both the members of the regulatory commissions and the constituents who put pressure on them must be "sold" on what the utilities' depreciation expenses are.

Regulators, and those of their constituents who are familiar with the concept of depreciation at all, are most accustomed to basing depreciation expense on the historical cost of the plant and equipment used. There is an alluring objectivity in basing depreciation on historical costs. Via historical-cost depreciation, utility managers do recover the same number of dollars that creditors and equity investors entrusted to them. Thus, there is an appealing nominal rationale behind historical-cost depreciation, although during periods of inflation, historical-cost depreciation may not "make whole" the positions of the electric utilities' creditors and stockholders, the effective suppliers of plant and equipment.

The technological-improvements explanation for electricity rates rising less than consumer prices generally may have camouflaged some of the shortcomings of historical-cost depreciation over the period covered by this study. Consciously or unconsciously, consumers, regulators, and even
electric utility managers may have attributed more cost-containment capacity to technological improvements than is warranted. Having this explanation for electricity rates rising less than consumer prices generally may have deterred probing for a fuller explanation of the differences between the pattern of electricity prices and the pattern of prices generally.

In contrast to plant and equipment, fuel is a current asset instead of a fixed asset. The cost of fuel is clear-cut. Although they may not like rapidly rising fuel costs, consumers, regulators, and utility managers all readily understand these costs. Because fuel is used relatively soon after it is purchased, the historical dollar measure of fuel consumed is a fairly accurate measure of the real quantities of fuel used. There is no way to postpone paying for fuel. Neither accounting nor technology is so likely to confuse the issue of just exactly what fuel costs are. So it is not surprising that whereas the bulk of the investor-owned electric utility industry is relatively well-equipped to deal with rapid changes in fuel costs with automatic fuel adjustment clauses, most of the industry is not similarly well-equipped to deal with rapid changes in the cost of fixed assets due to inflation. This sets the stage for Chapter III.

The purpose of Chapter III is (1) closely to examine the concept of depreciation, the cost of fixed assets consumed, and (2) to suggest a means of accomplishing with depreciation
expense during periods of inflation what automatic fuel adjustment clauses accomplish with fuel expense during periods of rapidly rising prices for fuel, only a portion of which rise in prices is the result of inflation.
CHAPTER III

MEASURING DEPRECIATION--THE BEST

METHOD FOR ELECTRIC UTILITIES

The purpose of this chapter is to closely examine the concept of depreciation. From this examination, criteria for what depreciation ought to accomplish will be established. Then, the four basic alternative methods of determining depreciation that are discussed in current accounting literature will be reviewed. Each of the four alternatives will be checked against the established criteria for depreciation. By this process, one method will be selected as the most logical for investor-owned electric utilities during periods of inflation.

The Concept of Depreciation

It is not one of the purposes of this chapter to explore the concept of depreciation on the level Arthur L. Thomas does in his American Accounting Association Studies Three and Nine. Rather, the objective of this section is simply to try to bring into sharp focus exactly what managers and accountants intend to be accomplishing when they compute and use depreciation as they presently do and what they are actually accomplishing.
Here is one definition of depreciation—from a respected book on public utility economics: "Broadly speaking, the depreciation of a capital asset is the loss, not restored by current maintenance, which is due to all the factors causing its ultimate retirement."¹

But this definition gives no clue as to how to measure the loss. Thus, for purposes of this dissertation, it may be more useful to establish the purpose of depreciation.

Depreciation accounting distributes the prepaid investment cost of depreciable assets to the production expense of each accounting period and serves the purposes of: (1) securing proper periodic income determinations; and (2) recovering gradually the utility's investment in depreciable assets.²

At this point, it is necessary to clarify what the "prepaid investment cost" of a depreciable asset is.

"In ideal situations cost is gauged by the amount of cash which is immediately expended to acquire the particular commodity or service involved."³ The word "gauged" seems to indicate that the amount of cash expended for a depreciable asset measures the prepaid investment cost of that asset. This still does not explain what the prepaid investment cost is.

The familiar adage, "I am not interested in money but in what it will buy," may provide the final answer to the

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²Ibid., p. 95.

question of exactly what the prepaid investment cost is. As this homely saying indicates, it is command over goods that is at the heart of money matters. It then seems logical to conclude that the prepaid investment cost of a depreciable asset is the command over goods in general that must be relinquished to acquire that asset. The command over goods in general that the purchaser loses is his ultimate cost. This is precisely what the economist means when he refers to "opportunity cost." Surely it is logical for all those who use the concept of depreciation and who are charged with the responsibility of seeing to it that depreciation properly performs its functions to keep in mind this notion of what investment cost is.

It is this notion of cost coupled with the concept of depreciation that leads precisely to what is called economic depreciation. "Simply defined, economic depreciation is the cost of depreciable assets consumed during a year, expressed in terms of the purchasing power of the original investment."^4

Despite the logic of viewing the cost of a depreciable asset as the command over goods in general given up in exchange for that asset, this view of cost is not the prevailing view. The prevailing view held by consumers, regulators, and managers is that cost is "the amount of cash which is immediately expended to acquire the particular

^4Garfield and Lovejoy, p. 106.
commodity or service involved." Note that the prevailing
view is not that cost is "gauged by the amount of cash which
is immediately expended" but rather that cost is "the amount
of cash which is immediately expended." This is the account-
ing concept "historical cost."

It is one of the postulates of generally accepted account-
ing principles that the dollar is a stable unit of measure.
When this postulate is valid, there is little or no practical
difference between economic depreciation and depreciation
based on historical costs. But as Figure 18---GNP Implicit
Price Deflator in Chapter II implies, the dollar was not a
stable unit of measure during the period covered by this study.
The dollar's command over goods in general shrank very signifi-
cantly. The postulate, therefore, was not valid.

During periods of inflation, economic depreciation and
depreciation based on historical costs diverge. The greater
the inflation, it seems likely, the greater the divergence.
It is with depreciation errors due to inflation and due only
to inflation that this study is concerned. This study may
then make some small contribution to a very much larger issue,
viz., the consequences of inflation.

By reviewing the four basic methods of measuring depre-
ciation, it will be possible to better understand the

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\footnote{5See William W. Pyle, John Arch White, and Kermit D.
Larson, \textit{Fundamental Accounting Principles} (Homewood, 1978),
p. 12.}
divergence, during periods of inflation, between economic depreciation, historical-cost depreciation, and still other kinds of depreciation. The next section of this chapter is devoted to such a review.

Four Methods of Measuring Depreciation

In an article titled "The Confusion Between General Price-Level Restatement and Current Value Accounting," Paul Rosenfield develops a useful four-category scheme for classifying alternative ways of accounting. It is a two-dimensional scheme. One dimension is the "standard to compare diverse resources." The other dimension is the "relationships between diverse resources and the standard."

Units of money are one standard. Units of general purchasing power are another.

Historical cost, which Rosenfield defines as "the quantity of the standard sacrificed to obtain the resource," is one relationship between a resource and a standard. Replacement cost, which Rosenfield defines as "the quantity of the standard that is required to replace the resource," is another relationship.

It is these two standards and these two relationships that form a four-category scheme for classifying alternative ways of accounting. It is these four different ways of

6The Journal of Accountancy, October, 1972, pp. 63-68.
accounting that pervade current accounting literature and that are used throughout this study. They are (1) units of money—historical cost (UOM-HC), (2) units of money—replacement cost (UOM-RC), (3) units of purchasing power—historical cost (UOPP-HC), and (4) units of purchasing power—replacement cost (UOPP-RC). Specifically, it is these four alternative ways of accounting as they apply to depreciation that permeate this study.

An Example

A numerical example may help illustrate how depreciation is affected by each of these four different methods of accounting. Assume that this example covers the period from January 1, 1971 through December 31, 1975. Further assume that at the end of 1970 an electric utility buys depreciable plant and equipment for $100,000. Finally, assume that the regulatory commission to which this utility is subject permits a 3 per cent annual depreciation rate on this $100,000 investment. All depreciation is taken at the end of each year.

The actual GNP implicit price deflator will serve as the measure of the general level of prices. The actual Handy-Whitman electric utility construction cost index for the north central region of the United States will be used to determine replacement costs. These indexes for the years 1970 through 1975 are shown in Table II.
<table>
<thead>
<tr>
<th>Year</th>
<th>GNP Implicit Price Deflator</th>
<th>Handy-Whitman Electric Utility Construction Cost Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>91</td>
<td>209</td>
</tr>
<tr>
<td>1971</td>
<td>96</td>
<td>222</td>
</tr>
<tr>
<td>1972</td>
<td>100</td>
<td>243</td>
</tr>
<tr>
<td>1973</td>
<td>106</td>
<td>248</td>
</tr>
<tr>
<td>1974</td>
<td>116</td>
<td>271</td>
</tr>
<tr>
<td>1975</td>
<td>127</td>
<td>341</td>
</tr>
</tbody>
</table>


To appreciate fully the differences in how depreciation is computed and reported under the four alternative ways of accounting, it is necessary to consider two views, viz., current and noncurrent.

In this example, the current view will be illustrated by looking at 1971 depreciation at the end of 1971, looking at 1972 depreciation at the end of 1972 and so on. With the current view, the focus is on the computation of the depreciation.

The noncurrent view has an additional dimension, an intervening period of time. In this example, the noncurrent
view will be illustrated by looking at 1971 depreciation at the end of 1975, looking at 1972 depreciation at the end of 1975, and looking at all other years' depreciation at the end of 1975. With the noncurrent view, the focus is on the reporting of previously-computed depreciation.

**Current View**

Let \( H \) = the historical cost of the depreciable asset,

\( R \) = the depreciation rate permitted by the regulatory agency,

\( W_c \) = the Handy-Whitman electric utility construction cost index for the current year,

\( W_a \) = the Handy-Whitman electric utility construction cost index for the year the depreciable asset was acquired,

\( D_c \) = the GNP implicit price deflator for the current year, and

\( D_a \) = the GNP implicit price deflator for the year the depreciable asset was acquired.

The formulas used to compute current-period depreciation under each of the four different ways of accounting are then as follows:

1. UOM-HC depreciation = \( H \times R \)
2. UOM-RC depreciation = \( H \times \frac{W_c}{W_a} \times R \)
3. UOPP-HC depreciation = \( H \times \frac{D_c}{D_a} \times R \)
4. UOPP-RC depreciation = \( H \times \frac{W_c}{W_a} \times R \)

Table III shows the amount of current-period depreciation for this example for each year 1971 through 1975 as
determined by each of the four different formulas for the four different ways of accounting.

TABLE III

DEPRECIATION--CURRENT PERIOD

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. UOM-HC</td>
<td>$3,000</td>
<td>$3,000</td>
<td>$3,000</td>
<td>$3,000</td>
<td>$3,000</td>
</tr>
<tr>
<td>2. UOM-RC</td>
<td>3,187</td>
<td>3,488</td>
<td>3,560</td>
<td>3,890</td>
<td>4,895</td>
</tr>
<tr>
<td>3. UOPP-HC</td>
<td>3,165</td>
<td>3,297</td>
<td>3,495</td>
<td>3,824</td>
<td>4,187</td>
</tr>
</tbody>
</table>

Units of Money--Historical Cost Depreciation

Depreciation as determined by the UOM-HC method is the familiar depreciation computed according to generally accepted accounting principles. This is the prevailing method for determining depreciation. In this example, UOM-HC depreciation is a constant $3,000 each year over the five-year period.

Since this has been the prevailing method of computing depreciation for decades, one of its major virtues is that it is widely understood. Also, it is objective. It does yield a recovery of "the amount of cash which was immediately expended to acquire the particular commodity or service involved."
However, as explained in the first section of this chapter, this method of accounting rests on the assumption that the monetary unit has stable purchasing power. Since the purchasing power of the dollar over the period 1971 through 1975 actually was not stable, this method is defective. During periods of inflation, depreciation determined by the UOM-HC method will not perform the functions of depreciation. It will not distribute prepaid investment costs—costs being defined as command over goods in general given up—so as to secure proper periodic income determinations or to recover gradually the investment in depreciable assets.

Units of Money--Replacement Cost Depreciation

The Securities and Exchange Commission (SEC) presently requires specified companies to include replacement cost data for plant and equipment, inventories, cost of sales, and depreciation in the annual reports these companies file with the SEC. This suggests that the SEC may be encouraging business to begin to adopt, or at least think in terms of, this second method of accounting.

This method uses units of money as the standard, as do present generally accepted accounting principles. But instead of using the historical cost relationship between diverse resources and the standard, this method of accounting uses the replacement cost relationship. With this method of
accounting the amount of depreciation is racheted up or down, from UOM-HC depreciation, in perfect unison with the increase or decrease in replacement costs between the date the depreciable asset was acquired and the period for which depreciation is computed.

In this example, UOM-RC depreciation for 1971 is $3,187. That is $187, or 6.2 per cent, greater than the $3,000 UOM-HC depreciation for 1971 because the electric utility construction cost index for 1971, 222, is precisely 6.2 per cent greater than the index for 1970, 209. Also in this example, because the construction index was greater each year than it was the preceding year, the UOM-RC depreciation amounts are progressively greater than their corresponding UOM-HC depreciation figures. By 1975, 1975 UOM-RC depreciation is 63 per cent greater than 1975 UOM-HC depreciation.

The big challenge with this method of accounting is determining just what replacement costs are. The Handy-Whitman indexes of public utility construction costs meet this challenge reasonably well for investor-owned electric utilities. Of course these indexes suffer the defects of indexes generally, e.g., not being able to accommodate advances in technology. Also, although the Handy-Whitman indexes are prepared for six different geographic regions in the United States, it is still true that a specific company's actual experience with construction costs will almost certainly differ some from the regional average.
Determining depreciation this second way would enable a firm to recover an amount of money approximately equal to the current cost of replacing that portion of the depreciable asset that the depreciation rate implies was used up. But, as they were explained in the first section of this chapter, neither the definition of depreciation nor the functions of depreciation say anything about replacement. Depreciation pertains to investments which were actually made at some time in the past. Replacements that might, or even definitely will, be made in the future are a separate, completely different matter. Given the concept and functions of depreciation explained in the first section of this chapter, amounts recovered via depreciation must be tied not to the replacement of the depreciable asset but to the actual investment in the depreciable asset.

Even if the shift in orientation to replacement costs were granted, UOM-RC depreciation could be criticized on other grounds. One significant defect of UOM-RC depreciation is that it does not allow for the operating cost savings that a replacement asset might yield. The following excerpt from the Mead Corporation's 1978 Annual Report nicely makes this point.

The replacement costs of productive capacity have reflected inflationary pressures. As a result, the cost of replacing existing productive capacity is subsequently in excess of historical costs. Accordingly, depreciation and depletion charges based on replacement costs would substantially exceed those based on historical cost. It should be pointed out,
however, that should the company's productive capacity be replaced, certain operating efficiencies would normally be realized, thus partially offsetting some of the effects of such escalating costs.\(^7\)

Of course not allowing for operating cost savings seriously impedes UOM-RC depreciation's performing the "securing proper periodic income determinations" function of depreciation.

There are still other questions about UOM-RC depreciation. What if management decides to replace the old depreciable asset with an entirely different one, e.g., a coal-fired generator with a natural gas-fired generator? What if management opts not to replace the firm's depreciable assets at all?

**Units of Purchasing Power—Historical Cost Depreciation**

In this third method of accounting, the standard for comparing diverse resources changes from units of money to units of general purchasing power. The relationship between resources and the standard is the same as in the first method, viz., historical cost. It is this third method of accounting that the Financial Accounting Standards Board (FASB) was advocating when, in 1974, it

\[
\ldots \text{urged the preparation of financial statements in constant dollars and the presentation of such statements as supplementary information in corporate annual reports. The FASB stressed that its proposal would change only the measuring unit, not the accounting}\]

\(^7\text{Mead Corporation 1978 Annual Report, p. 36.}\)
principles themselves—including the bedrock principle of acquisition cost valuation.\(^8\)

Some critics of this method of accounting argue that businesses do not experience general price increases. Rather, they face particular price increases. Of course this is true. It is most unlikely that the prices a business pays for the particular goods and services it acquires would fluctuate precisely in tandem with the prices of goods and services generally. But again it seems appropriate to raise the question, is this point relevant to accurate depreciation—given the concept and functions of depreciation developed in the first section of this chapter?

The definition and functions of depreciation as previously discussed say nothing about the replacement of depreciable assets. Instead, they emphasize proper periodic income determinations and recovery of the cost of investments actually made. When the cost of those investments is viewed as the relinquished command over goods in general, it seems reasonable to expect to recover command over goods in general. To the extent the income figure incorporates that recovery of command over goods in general depreciation amount, the income figure to that extent seems proper.

Units of Purchasing Power—Replacement Cost Depreciation

Compared to the familiar UOM-HC method of accounting, this fourth method of accounting changes both the standard for comparing diverse resources and the relationship between resources and the standard. This fourth method uses units of general purchasing power as the standard and replacement cost as the relationship.

When computed and reported in current-year dollars, e.g., 1971 depreciation determined and reported at the end of 1971, depreciation computed by this fourth method is the same as depreciation determined by the second method, UOM-RC. This is the case because the factor $\frac{W_c}{W_a}$ which is in the depreciation formula for the second method is also in the depreciation formula for this fourth method. This factor insures that the depreciation amounts arrived at by both accounting methods are in dollars current for the period for which the depreciation is being determined. So when these depreciation figures are viewed and reported at the time they are determined, these depreciation amounts are simultaneously in units of money and in units of purchasing power. For current-period UOPP-RC depreciation, there is simply no unaccounted-for lapse of time during which the purchasing power of the dollar could change. Thus, the UOPP-RC depreciation amounts shown in the fourth row of Table III are the same as the UOM-RC depreciation amounts shown in the second row.
Comparing Current-Period Depreciation
Measured by the Four Different Methods of Accounting

The purpose of this section is to take a close look at the differences in the current-period depreciation amounts. The emphasis will be on the difference between UOM-RC depreciation and UOPP-HC depreciation because it is, judging from current accounting literature, the UOM-RC method of accounting and the UOPP-HC method of accounting that appear to be in the ascendancy.

Two Caveats

Probably the most noteworthy feature of the data in Table III is the large amounts by which depreciation determined by accounting methods two, three, and four differ from depreciation determined by accounting method one, generally accepted accounting principles and the currently prevailing method. Nineteen seventy-five UOM-RC depreciation is 63 per cent greater and 1975 UOPP-HC depreciation is 40 per cent greater than the 1975 UOM-HC depreciation. The 63 per cent and the 40 per cent are the total percentages by which electric utility construction costs and the general level of prices, respectively, increased over the period January 1, 1971 through December 31, 1975.

Because replacements costs and the general level of prices rose more over this five-year period than any other five-year period in recent United States history, the
differences in depreciation amounts shown in this table are, for that reason, unrepresentative of recent United States history. The differences are unrepresentatively large for five-year periods during which inflation is less severe. Of course it is also true that for five-year periods of inflation more severe than the United States experienced from January 1, 1971 through December 31, 1975, the differences shown in the depreciation figures in Table III would be unrepresentatively small.

There is another important factor entering into the differences in depreciation amounts, viz., time. For any given rate of increase in replacement costs or the general level of prices, UOM-RC depreciation and UOPP-HC depreciation will diverge from UOM-HC depreciation more over a longer period of time than over a shorter period. The 3 per cent depreciation rate, which is realistic for electric utilities, is a reminder that the typical investor-owned electric utility depreciable asset has a life of more than thirty years. Thus, the average age of the electric utility industry's plant might very well be, say, ten years. However, the data in Table III cover only the first five years of the life of the depreciable asset. Since UOM-RC depreciation and UOPP-HC depreciation will diverge from UOM-HC depreciation more over a longer period of time than over a shorter period of time and since the actual average age of the electric utility industry's plant is almost certainly greater
than five years, the data in Table III are unrepresentative for this second reason. The differences in the depreciation figures shown in Table III are almost certainly unrepresentatively small because they cover a shorter period than the average period the electric utility industry has actually owned its plant.

**UOM-RC Depreciation Contrasted with UOPP-HC Depreciation**

The difference between UOM-RC depreciation and UOPP-HC depreciation warrants special attention. The difference in depreciation amounts as determined by these two methods is due to electric utility construction costs increasing at a different rate, faster in this case, than the increase in the general level of prices. It is extremely unlikely that electric utility construction costs and the general level of prices would change at the same rates. But just what are the implications of these differences?

Prices are a function of many factors, certainly not just of inflation. And prices perform a vital function in channeling scarce resources into those uses which consumers value most highly. If an economy is to use its resources efficiently, it is important that nothing interfere with prices. For purposes of this particular study, it is important that no consumer, regulator, or investor-owned electric utility manager be insulated or sheltered from the full impact of prices.
In a section, entitled "The Changeability of Prices," in one of his books, Ludwig von Mises had this to say about prices:

Exchange ratios are subject to perpetual change because the conditions which produce them are perpetually changing. The value that an individual attaches both to money and to various goods and services is the outcome of a moment's choice. Every later instant may generate something new and bring about other considerations and valuations. Not that prices are fluctuating, but that they do not alter more quickly could fairly be deemed a problem requiring explanation.

Daily experience teaches people that the exchange ratios of the market are mutable. One would assume that their ideas about prices would take full account of this fact. Nevertheless all popular notions of production and consumption, marketing and prices are more or less contaminated by a vague and contradictory notion of price rigidity. The layman is prone to consider the preservation of yesterday's price structure both as normal and as fair, and to condemn changes in the exchange ratios as a violation of the rules of nature and of justice.

Neither atavistic reminiscences nor the state of selfish group interests can explain the popularity of the idea of price stability. Its roots are to be seen in the fact that notions concerning social relations have been constructed according to the pattern of the natural sciences. The economists and sociologists who aimed at shaping the social sciences according to the pattern of physics or physiology only indulged in a way of thinking which popular fallacies had adopted long before.

Even the classical economists were slow to free themselves from this error. With them value was something objective, i.e., a phenomenon of the external world and a quality inherent in things and therefore measurable. They utterly failed to comprehend the purely human and voluntaristic character of value judgments. As far as we can see today it was Samuel Bailey who first disclosed what is going on in preferring one thing to another. But his book was overlooked as were the writings of other precursors of the subjective theory of value.

It is not only a task of economic science to discard the errors concerning measurability in the field of action. It is no less a task of economic policy.
For the failures of present-day economic policies are to some extent due to the lamentable confusion brought about by the idea that there is something fixed and therefore measurable in interhuman relations.  

Since the concern of this dissertation is the impact of inflation, and only of inflation, on depreciation on investor-owned electric utilities, it is only the inflation component of prices that is to be isolated and dealt with. All other factors impinging on prices are to be assiduously preserved. If these other factors incorporated in prices are not preserved, prices will not continue to perform their functions as well as they will if these other factors in prices are preserved. Resuming with the numerical example may help clarify this point.

Assume the $100,000 of depreciable assets were 100 per cent equity financed. Take the 1975 UOM-RC depreciation ($4,895) and the 1975 UOPP-HC depreciation ($4,187), to use specific data.

If a manager who recovered $4,187 in depreciation promptly distributed that amount to the stockholders who provided the $100,000 used to acquire the depreciable assets at the end of 1970, these stockholders would, in 1975, rightly consider this $4,187 a recovery of 3 per cent of their investment. They would now be in the same position they were at the end of 1970 when they gave up $3,000 for 3 per cent of the total investment.

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The command over goods in general that $4,187 had on December 31, 1975 is the same as the command over goods in general that $3,000 had on December 31, 1970.

If instead, this same manager went out and acquired assets to replace those he used up in 1975, he would be short $708. (He recovered UOPP-HC depreciation of $4,187 but needed the amount indicated by UOM-RC depreciation, i.e., $4,895.) If he then went to his stockholders and told them they would have to invest an additional $708 just to maintain the productive capacity of their company, the stockholders might balk. Is not this as it should be? Surely the managers and stockholders of this utility ought not be insulated from the price-sighaled facts of life. The difference in these two depreciation figures indicates that it is now relatively more expensive to be in the electricity business than it was when the stockholders first decided to invest in this business at the end of 1970. The cost of fixed assets used to generate, transmit, and distribute electricity is up about 17 per cent more than the cost of goods and services generally. Equity investors might decide it is still a good business to be in and they might not. But the decision to stay in a given business or not is clearly an issue separate and distinct from proper periodic income determinations and recovering the stockholders' original investment, the functions of depreciation.
If the manager recovered $4,895 and immediately distributed that amount to the stockholders, the stockholders would be getting back an amount with 17 per cent more command over goods in general than they originally gave up. That is not equitable.

If instead, the manager used the $4,895 to replace the depreciable assets used up in 1975, he would not have to call upon the stockholders for additional funds to maintain the firm's productive capacity. Because he would not have to go to the stockholders, it seems that the stockholders would be wholly, and the manager himself would be at least partly, insulated from the noninflationary factors in 1975 electric utility construction costs. If investors and managers are even partially insulated from the noninflationary factors in prices, it seems likely that prices would not channel resources in the same direction they would if those investors and managers had to base their decisions on prices that embody all of the factors, inflationary and noninflationary, bearing on those prices. In short, it seems likely that UOM-RC depreciation would lead to a less efficient allocation of scarce economic resources, a very undesirable situation.

Four Methods of Reporting Noncurrent-Period Depreciation

To complete this discussion of depreciation determined by the four different methods of accounting, it is necessary to take a noncurrent view also. This means to view, say
1971 UOM-RC depreciation, from the end of 1972 or from the end of 1975 or from any other than the end of 1971.

Let $D_e$ = the GNP implicit price deflator for the ending year in terms of whose dollars all other data are quoted.

The formulas used to determine noncurrent-period depreciation under each of the four different ways of accounting are then as follows:

1. UOM-HC depreciation = $H \times R$

2. UOM-RC depreciation = $H \times \frac{W_c}{W_a} \times R$

3. UOPP-HC depreciation = $H \times \frac{D_c}{D_a} \times R \times \frac{D_e}{D_c}$

4. UOPP-RC depreciation = $H \times \frac{W_c}{W_a} \times R \times \frac{D_e}{D_c}$

The passage of time does nothing to the relationship between diverse resources and the standard used. Historical cost remains historical cost; replacement cost remains replacement cost. Neither does the passage of time do anything to alter the units of money standard.

From this it follows that noncurrent-period UOM-HC depreciation is identical to current-period UOM-HC depreciation. Also, noncurrent-period UOM-RC depreciation is identical to current-period UOM-RC depreciation. Therefore the formulas for determining noncurrent-period UOM-HC depreciation and noncurrent-period UOM-RC depreciation are identical to their corresponding current-period depreciation formulas.
However, with the passage of time, the purchasing power of the dollar may change. During periods of inflation, the purchasing power of the dollar definitely will change. The factor $\frac{D_e}{D_c}$ is added to the two UOPP current-period depreciation formulas to compensate for the changes in the purchasing power of the dollar. The net effect is to replace the unstable dollar standard with a stable unit of purchasing power standard. Specifically, that unit of purchasing power is the ending year ($Y_{\text{e}}$) dollar. All amounts are converted to $Y_{\text{e}}$ constant dollars. Because the UOPP standard is stable for all periods for which data are being reported, each year's depreciation, as determined by formulas three and four, is directly comparable to every other year's depreciation.

With 1975 as the ending year, Table IV shows noncurrent-period depreciation amounts for the illustrative example introduced earlier.

### Table IV

**Depreciation—Noncurrent Period**

(1975 Constant Dollars)

<table>
<thead>
<tr>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. UOM-HC</td>
<td>$3,000</td>
<td>$3,000</td>
<td>$3,000</td>
<td>$3,000</td>
<td>$3,000</td>
</tr>
<tr>
<td>2. UOM-RC</td>
<td>3,187</td>
<td>3,488</td>
<td>3,560</td>
<td>3,890</td>
<td>4,895</td>
</tr>
<tr>
<td>3. UOPP-HC</td>
<td>4,187</td>
<td>4,187</td>
<td>4,187</td>
<td>4,187</td>
<td>4,187</td>
</tr>
<tr>
<td>4. UOPP-RC</td>
<td>4,216</td>
<td>4,430</td>
<td>4,265</td>
<td>4,259</td>
<td>4,895</td>
</tr>
</tbody>
</table>
As previously explained, with the passage of time the historical cost of depreciable assets in terms of units of money does not change. Neither does the replacement cost of depreciable assets on a given date in terms of units of money change. The amounts of noncurrent-period depreciation determined by accounting methods one and two are the same as the corresponding current-period depreciation amounts. Thus, the first two rows of Table IV are identical to the first two rows of Table III.

UOPP-HC depreciation is a constant $4,187 each year for 1971 through 1975. As indicated by the formula for determining noncurrent-period depreciation with the third method of accounting, these amounts are simply current-period depreciation amounts "rolled forward" to restate them in constant 1975 dollars.

Although current-period UOPP-RC depreciation was identical with current-period UOM-RC depreciation, noncurrent-period UOPP-RC depreciation (row four in Table IV) is certainly not identical with noncurrent-period UOM-RC depreciation (row two in Table IV).

The 1975 UOPP-RC depreciation, $4,895, is the same as 1975 UOM-RC depreciation because for that single year the UOPP standard is the same as the UOM standard. It will always be true that UOPP-RC depreciation for the ending year in terms of whose dollars all depreciation amounts are quoted in noncurrent-period UOPP-RC data will be the same as
current-period UOM-RC depreciation for that ending year and noncurrent-period UOM-RC depreciation for that ending year.

But from 1974 back through 1971, noncurrent-period UOPP-RC depreciation differs from noncurrent-period UOM-RC depreciation. The further back the data go, the greater the difference. While the UOPP-RC depreciation remains relatively stable—hovering between a low of $4,216 (in 1971) and a high of $4,430 (in 1972), a 5 per cent fluctuation—1974 back through 1971, UOM-RC depreciation steadily declines from $3,890 (in 1974) to $3,187 (in 1971), a 22 per cent decline.

The UOPP-RC depreciation over this particular period, 1971 through 1974, is relatively stable because over this period the annual increase in electric utility construction costs roughly corresponded to the annual increases in the general level of prices. UOM-RC depreciation steadily declines from 1974 back through 1971 because electric utility construction costs declined each year from 1974 back through 1971.

Just what does this noncurrent-period depreciation data tell us about depreciation, as the concept and its functions were explained in the first section of this chapter? The 3 per cent per year depreciation rate used in the illustrative example implies a constancy over time. The loss of command over goods in general concept of cost implies that units of purchasing power are the appropriate standard to measure recovery of cost. Thus, the data in Table IV are at
least prima facie evidence that over time depreciation determined and reported by the UOPP-HC method of accounting is the depreciation that would secure and show proper periodic income determinations and recover gradually a firm's prepaid investment cost of depreciable assets. Only noncurrent-period UOPP-HC depreciation is (1) constant over time and (2) in units of purchasing power.

Conclusion

Having completed an examination of both current-period and noncurrent-period depreciation computed and reported by using each of the four alternative accounting methods, it should now be possible to conclude which method yields the best depreciation.

The Criteria

The first part of the hypothesis that underlies this dissertation is that underdepreciation is the cause of serious problems with which investor-owned electric utilities are currently confronted. This study is limited to assessing underdepreciation due to inflation. To demonstrate that there is underdepreciation, it must be shown (1) what depreciation ought to be, (2) what depreciation actually has been, and (3) that the latter amounts were less than the former amounts.

In the first section of the chapter, it was established what depreciation ought to accomplish, viz., (1) to secure
proper periodic income determinations and (2) to recover gradually a firm's investment cost—using the economist's notion of opportunity cost, the command over goods in general relinquished to acquire the depreciable asset.

Put another way, the best depreciation for the purpose of this study is that depreciation which during periods of inflation accomplishes for a firm and investors what historical-cost depreciation accomplishes during periods when there is no inflation. The accounting method which yields this depreciation may not be the best accounting method for other purposes. It will be helpful to make explicit just what historical-cost depreciation does accomplish during noninflationary periods.

Assuming revenues are sufficiently great, historical-cost depreciation during noninflationary periods puts back into the hands of management an amount of money equal to the amount of money that management had to spend to acquire that portion of the depreciable asset that the depreciation rate implies was used up during the specified accounting period. Since it is assumed that there is no inflation, the significant thing about that amount of money is that it restores to management the command over goods in general that management relinquished to acquire the portion of the depreciable asset that was lost during the accounting period.
Especially note what this amount of money does not do. It does not restore to management the command over a portion, indicated by the depreciation rate, of any particular good, including the particular depreciable asset in question. If management could with the money recouped via the historical-cost depreciation allowance replace the loss in the particular depreciable asset in question, that would be coincidental. It would be coincidental because, as von Mises explains in the quotation cited above, prices of particular goods almost certainly will rise some or fall some even during periods of no inflation.

Perhaps because depreciable assets are so frequently replaced, perhaps because the SEC has put its imprimatur on replacement costs, perhaps because in exchange for their franchises utilities are required to provide a specified service to all users, the notion that depreciation should restore to management the purchasing power necessary to replace particular depreciable assets may insinuate itself into thinking on depreciation--especially into thinking about depreciation for utilities. Whatever the reason, it is unfortunate that depreciation and replacement cost have become so intwined. Depreciation is one thing. Replacing a depreciable asset is quite another. The depreciation of an asset and the replacement of that depreciable asset are simply two distinctly separate, different matters.
It follows that if depreciation during inflationary periods is to accomplish what historical-cost depreciation accomplishes during noninflationary periods, it should not, except by sheer coincidence, be an amount that would enable management to replace the loss in the depreciable asset either. A depreciation amount that would enable management to replace the loss in a depreciable asset would dull that management's appreciation of price changes due to factors other than inflation. That management, and others, would lose some of the sensitivity to price fluctuations which historical-cost depreciation during noninflationary periods soundly preserves. If investors, managers, and regulators are to be properly attuned to the marketplace, the sought-for depreciation for inflationary periods must also leave managers and others sensitive to price changes due to factors other than inflation.

**Units of Money—Historical Cost Depreciation**

UOM-HC depreciation may in some sense secure a proper numerical income determination. However, during periods of inflation there is some question as to just what those numbers represent. Perhaps subtracting the quantity 3 pesos plus 4 escudos from 100 yen equals 93 something. But what the something is is certainly not clear. Similarly, subtracting UOM-HC dollar depreciation amounts for depreciable assets acquired over many different years from a single year's
revenue dollars results in something that is certainly not clear.

Via UOM-HC depreciation management recovers the right number of dollars, if right means the same number as the number invested in the depreciable asset. But especially during periods of inflation, it becomes apparent that the number of dollars is really not the important attribute of dollars. During periods of inflation it becomes obvious that command over goods in general is the all-important feature of dollars.

Because the dollar price of particular goods might not rise during the period of generally rising prices, it is theoretically possible that UOM-HC depreciation would enable management to recover the same command over a particular asset that management had at the outset. But practically, this is a very unlikely possibility.

During a period of generally rising prices, UOM-HC depreciation does not either theoretically or practically enable management to recover the command over goods in general that management initially gave up to acquire the depreciable asset. It is the failure of UOM-HC depreciation to do this that prompts this entire study. Because during periods of inflation UOM-HC depreciation fails to perform any of the established criteria-functions of depreciation, it is rejected.
Units of Money--Replacement Cost Depreciation

Income arrived at by using UOM-RC depreciation does have something to recommend it. That income figure does represent an amount which, assuming a firm is committed to staying in the same line of business (an especially reasonable assumption in the case of franchised utilities), could be distributed without impairing the firm's productive capacity. If avoiding brownouts and blackouts, or interruptions of whatever good or service the firm is presently producing, is the paramount concern, this is no inconsequential virtue. Astute investors are cognizant of this virtue.

For example, when a reporter for Forbes asked Larry Tisch what qualities he looks for in a company that he wants to buy for Loews, its stock portfolio or as a private investor, he responded,

The one thing I look for most is free cash flow after all capital expenditures. Profits that have to be reinvested in more capital outlays may not really be profits at all.

Most of the time you should expense capital outlays in the year they are incurred, not capitalize them and add them to the balance sheet. More and more, a big company has to go on spending money just to maintain its existing earnings stream. Isn't that really an expense, rather than something that should be considered as a true increase in value?10

It is important, however, not to be swayed by a "useful" income figure when the objective is a "proper" income figure. And "proper" income, in the confines of this dissertation, means income which embodies "proper depreciation.

10Forbes, June 11, 1979, p. 94.
As previously explained, UOM-RC depreciation is very likely to be guilty of a "cover up." It is very likely partially, if not wholly, to desensitize its users to price changes in replacement assets due to noninflationary factors.

If the price of a particular replacement asset increases more than the general level of prices, UOM-RC will be off by the difference in the increases. This would lead to an overstatement of depreciation and thus an understatement of income. If the price of the particular replacement asset increased less than the general level of prices, UOM-RC depreciation would be understated and income overstated. Since, as explained earlier, it is most unlikely that particular prices will change exactly as the general level of prices changes, UOM-RC depreciation is very likely to lead to an overstatement or an understatement of income, i.e., to an improper income determination.

The portion of a footnote from The Mead Corporation's 1978 Annual Report cited above points out how the UOM-RC method of accounting calculates depreciation as if the depreciable asset were replaced. If the depreciable asset were in fact replaced, there would likely be operating cost savings. But the operating costs used in the UOM-RC income determination are not reported as if the depreciable asset were replaced.

UOM-RC depreciation would result in management's recovering command over more goods in general than it relinquished
when it acquired the depreciable asset if the prices of replacement assets increase more than prices of goods in general. This was the case in the illustrative numerical example, especially in 1975.

In 1975, the electric utility construction cost index rose 26 per cent. Prices in general rose 9 per cent. With UOM-RC depreciation, management would have recovered $4,895 in 1975--17 per cent more than the $4,187 it would have needed to recover the command over goods in general that it gave up to acquire the portion of the depreciable asset used up in 1975.

UOM-RC depreciation would result in management's recovering command over fewer goods in general than it relinquished when it acquired the depreciable asset if the prices of replacement assets increase less than prices of goods in general.

Because during periods of inflation UOM-RC depreciation would restore to management more or less, but only by sheer coincidence the same, command over goods in general that management gave up for the depreciable asset, UOM-RC depreciation does not accomplish during periods of inflation what UOM-HC depreciation accomplishes during noninflationary periods. Since UOM-RC depreciation does not perform the established criteria-functions of depreciation, it too is rejected.
Units of Purchasing Power--Historical Cost Depreciation

Unlike the income figure arrived at by using UOM-RC depreciation, UOPP-HC income could not necessarily be distributed without impairing the firm's productive capacity. What management may prudently do with income arrived at using UOPP-HC depreciation would depend on the change in the price of replacement assets relative to the change in the general level of prices.

For example, if replacement costs went up more than prices generally, some, all or maybe even more than all of the income arrived at using UOPP-HC depreciation could not be distributed without eroding the firm's productive capacity. But this is not saying that income arrived at using UOPP-HC depreciation is an "improper" income determination. A depreciation amount which results in an income amount which could be distributed without impairing the firm's productive capacity is not one of the criteria-functions of depreciation in this study. It has been argued at various points in this chapter that replacing assets, a requisite for maintaining a firm's productive capacity, is a separate, different issue from the issue of depreciation.

There is no "cover-up" feature in UOPP-HC depreciation. If through UOPP-HC depreciation management recovers an amount which exceeds or falls short of the cost of replacing the loss in the depreciable asset during the accounting period, that excess or deficit will be due to the general level of
prices increasing more than or less than the increase in the cost of replacing the asset. That excess or deficit is due to factors other than inflation. Since the concern of this dissertation is the impact of inflation on the depreciation expense of investor-owned electric utilities, it is important to leave the effects of noninflationary forces on prices uncovered. UOPP-HC depreciation does this.

UOPP-HC depreciation does accomplish during periods of inflation the significant thing that UOM-HC depreciation accomplishes during noninflationary periods, viz., it restores to management an amount of money which gives management the same command over goods in general that management gave up when it acquired the depreciable asset. Also, like UOM-HC depreciation during noninflationary periods, UOPP-HC depreciation during inflationary periods does not, except by coincidence, restore to management an amount of money which gives management the same command over the particular good being depreciated that management had when it originally acquired that particular good.

Because during periods of inflation UOPP-HC depreciation does seem to perform the established criteria-functions of depreciation, it is accepted. For this reason, it is the UOPP-HC method of accounting as it applies to depreciation, that will be used in determining what depreciation the investor-owned electric utilities ought to have claimed in
recent years and to which the depreciation these utilities actually claimed will be compared in subsequent chapters.

**Units of Purchasing Power—Replacement Cost Depreciation**

As explained earlier, UOPP-RC current-period depreciation is identical to UOM-RC current-period depreciation. It is current-period depreciation that is relevant to this concluding section of this chapter on depreciation. So all of the comments made about UOM-RC depreciation in this final evaluation apply equally well to UOPP-RC depreciation. Thus, for at least the purposes of this study, UOPP-RC depreciation is also rejected.
The purpose of this chapter is to explain the application of the UOPP-HC method of determining depreciation to an actual company, Consumers Power Company of Jackson, Michigan; to report the results; and to contrast the UOPP-HC depreciation with depreciation determined by generally accepted accounting principles, i.e., by the UOM-HC method.

Although Consumers Power has a sizable natural gas business, this study is confined to the company's electricity business. Consumers Power Company was selected because of its relatively large size and its proximity.

The period studied was January 1, 1967 through December 31, 1977. This period was chosen for the following reasons: (1) it was deemed a long enough period to be a fairly representative sample; (2) of the depreciable assets Consumers Power owned on December 31, 1977, they acquired a sizable portion of them (59 per cent) over this period; (3) whereas the general level of prices rose 29 per cent from 1947 to 1957 and 20 per cent from 1957 to 1967, it rose 80 per cent from 1967 to 1977; (4) this study kept numerical
calculations just short of what could be managed feasibly only with a computer and (5) the study is as up-to-date as practicable.

The Depreciation Rates and a Simplification

Over the period studied, 1967 through 1977, Consumers Power was subject to three different sets of depreciation rates approved by the Michigan Public Service Commission. The different sets of rates became effective on January 1 of 1965, 1970, and 1975.

Except for transportation equipment, Consumers Power provides depreciation on the basis of straight-line rates for both regulatory and stockholder reporting purposes. For its transportation equipment, the company provides depreciation by the units-of-production method.

Effective January 1, 1975, Consumers' depreciable electric plant was distributed among fifty-eight accounts, each subject to a different rate of depreciation. Each of the company's eight major categories of depreciable assets is composed of from one to thirteen of these accounts. The eight major categories are (1) Steam Production Plant, (2) Nuclear Production Plant, (3) Hydraulic Production Plant, (4) Other Production Plant, (5) Transmission Plant, (6) Distribution Plant, (7) General Plant, and (8) Transportation Equipment. To simplify the mathematics of this study,
computations were based on the eight major categories of depreciable assets rather than on the fifty-eight separate accounts.

A specific example may help clarify this point. The first of Consumers' eight major categories of depreciable assets is "Steam Production Plant." This category is composed of six different accounts, each with its own depreciation rate. Specifically, these six accounts and their respective depreciation rates since January 1, 1975 are as follows: (1) Easement and Riparian Rights, 2.38 per cent; (2) Structures and improvements, 2.83 per cent; (3) Boiler Plant Equipment, 3.29 per cent; (4) Turbogenerator Units, 2.76 per cent; (5) Accessory Electric Equipment, 3.03 per cent; and (6) Miscellaneous Power Plant Equipment, 3.13 per cent.

Instead of applying these six different depreciation rates to the six different accounts when computing Consumers' depreciation on its "Steam Production Plant," a single composite rate was applied to the sum of the balances in the six accounts. Each of the six different depreciation rates was weighted in the composite depreciation rate in the same proportion that the mean average of the balances in each account on January 1, 1967 and December 31, 1977 had to the sum of those average balances.

Table V, a numerical illustration of this process, may help further clarify the derivation of the composite
depreciation rates. In Table V, Column 1 shows the January 1, 1967 balance in each of the six different accounts into which Consumers' steam production depreciable assets are distributed. Column 2 shows the December 31, 1977 balance in each of these six different accounts. The mean average of the January 1, 1967 balance and the December 31, 1977 balance in the six separate accounts is listed in Column 3. The total of these averages is also shown in Column 3. Column 4 shows what percentage the mean average of each of the six different accounts is of the total of the averages. These are the weights attached to each depreciation rate that enters into the composite depreciation rate. The annual depreciation accrual rates that became effective for Consumers on January 1, 1975 are listed in Column 5.

Each depreciation rate (Column 5) is then multiplied by its corresponding weight (Column 4). This then gives the individual components of the composite depreciation rate shown in Column 6. The sum of the individual components yields the composite depreciation rate of 3.0428 per cent. It was this composite depreciation rate that was used to simplify the computation of depreciation on Consumers' depreciable steam production plant for 1975, 1976, and 1977.

Because Consumers Power uses the units-of-production method to calculate depreciation on its transportation equipment and also because the category of assets "Transportation Equipment" is composed of just one account, a composite
<table>
<thead>
<tr>
<th>Account</th>
<th>(1) 1-1-67 Balance ($000)</th>
<th>(2) 12-31-77 Balance ($000)</th>
<th>(3) Average (1) + Col. (2) by 2 ($000)</th>
<th>(4) Weight Col. (3) by 510,825 ($)</th>
<th>(5) Depreciation Rates Effective 1-1-75 (%)</th>
<th>(6) Components Col. (4) x Col. (5) ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Easements</td>
<td>0</td>
<td>842</td>
<td>421</td>
<td>.08</td>
<td>2.38</td>
<td>.0019</td>
</tr>
<tr>
<td>Structures</td>
<td>87,894</td>
<td>126,930</td>
<td>107,412</td>
<td>21.03</td>
<td>2.83</td>
<td>.5951</td>
</tr>
<tr>
<td>Boiler</td>
<td>138,994</td>
<td>344,236</td>
<td>241,615</td>
<td>47.30</td>
<td>3.29</td>
<td>1.5562</td>
</tr>
<tr>
<td>Turbogenerator</td>
<td>89,558</td>
<td>168,926</td>
<td>129,242</td>
<td>25.30</td>
<td>2.76</td>
<td>.6983</td>
</tr>
<tr>
<td>Accessory</td>
<td>18,520</td>
<td>39,039</td>
<td>28,780</td>
<td>5.63</td>
<td>3.03</td>
<td>.1706</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>2,281</td>
<td>4,428</td>
<td>3,355</td>
<td>.66</td>
<td>3.13</td>
<td>.0207</td>
</tr>
<tr>
<td>Totals</td>
<td>...</td>
<td>...</td>
<td>510,825</td>
<td>100.00</td>
<td>...</td>
<td>3.0428</td>
</tr>
</tbody>
</table>
depreciation rate was not used in calculating depreciation on this eighth major category of depreciable assets.

**UOM-HC Depreciation**

Because estimated salvage values and estimated removal costs are built into the depreciation rates that the Michigan Public Service Commission permits Consumers Power to use, the company computes depreciation by applying to all depreciable assets but transportation equipment the following simple formula:

\[
\text{Depreciation Expense} = \frac{\text{Beginning of Yr. Balance} + \text{End of Yr. Balance}}{2} \times \text{Depreciation Rate}
\]

Consumers does this for fifty-seven of the fifty-eight accounts that they presently have their total depreciable electric plant divided into.

To determine UOM-HC for this study, essentially the same procedure was used. But rather than using the averages of beginning of year and end of year balances for fifty-seven separate accounts, the average of beginning of year and end of year balances of the first seven major categories of depreciable assets were used. And instead of fifty-seven separate depreciation rates, seven weighted composite depreciation rates, derived as explained above, were used. Of course since there were three different sets of depreciation rates that became effective on January 1 of 1965, 1970, and 1975, there were over the course of the eleven years from
1967 through 1977 three different sets of these composite depreciation rates.

Since a composite depreciation rate was not used in calculating depreciation on transportation equipment, the eighth major category of depreciable assets, the depreciation expense that Consumers Power actually claimed over the period 1967 through 1977 is also the UOM-HC depreciation shown in this study. By comparing the UOM-HC depreciation as computed in this study with the depreciation Consumers Power actually claimed over this period, it is possible to get a feel for the consequences of the simplification.

Consumers' UOM-HC depreciation as determined in this study is shown in the first column of data in Table VI. Consumers' actual reported depreciation is shown in the second column. The third column shows the percentage by which UOM-HC study depreciation deviates from actual depreciation.

Clearly, using composite depreciation rates on the eight major categories of depreciable assets rather than actual rates on the fifty-eight individual accounts gave the study data an upward bias. The most significant deviations of study depreciation from actual depreciation tend to be toward the middle of the period covered by the study. This may be explained by the weights assigned to the individual account depreciation rates that made up the
composite depreciation rates. Those weights were based on January 1, 1967 and December 31, 1977 asset amounts.

TABLE VI

CONSUMERS POWER COMPANY UNITS OF MONEY--HISTORICAL COST DEPRECIATION 1967-1977

<table>
<thead>
<tr>
<th>Year</th>
<th>As Determined In This Study (000)</th>
<th>Actual (000)</th>
<th>Study Depreciation Deviation From Actual Depreciation (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1967</td>
<td>29,341</td>
<td>29,211</td>
<td>+ .45</td>
</tr>
<tr>
<td>1968</td>
<td>31,388</td>
<td>31,165</td>
<td>+ .72</td>
</tr>
<tr>
<td>1969</td>
<td>33,415</td>
<td>33,037</td>
<td>+1.14</td>
</tr>
<tr>
<td>1970</td>
<td>36,471</td>
<td>36,064</td>
<td>+1.13</td>
</tr>
<tr>
<td>1971</td>
<td>38,442</td>
<td>37,834</td>
<td>+1.61</td>
</tr>
<tr>
<td>1972</td>
<td>43,449</td>
<td>41,689</td>
<td>+4.22</td>
</tr>
<tr>
<td>1973</td>
<td>50,045</td>
<td>49,153</td>
<td>+1.81</td>
</tr>
<tr>
<td>1974</td>
<td>54,521</td>
<td>51,906</td>
<td>+5.04</td>
</tr>
<tr>
<td>1975</td>
<td>58,829</td>
<td>59,682</td>
<td>-1.43</td>
</tr>
<tr>
<td>1976</td>
<td>62,861</td>
<td>62,411</td>
<td>+ .72</td>
</tr>
<tr>
<td>1977</td>
<td>67,209</td>
<td>67,265</td>
<td>- .08</td>
</tr>
<tr>
<td>Average</td>
<td>45,997</td>
<td>45,402</td>
<td>+1.31</td>
</tr>
</tbody>
</table>


The composite depreciation rates used to compute UOM-HC depreciation were also used to compute UOPP-HC depreciation. Thus, it seems reasonable to assume that there is probably an
upward bias in the UOPP-HC depreciation data in this study also. However, as the +1.31 per cent mean average deviation of UOM-HC study depreciation from actual depreciation indicates, that bias is quite small.

UOPP-HC Depreciation

Because all of the depreciable assets in the illustrative example used in Chapter III were acquired in the same year, the example may fail to bring out an important point. To compute UOPP-HC depreciation, it is necessary to vintage the depreciable assets.

It is necessary to keep account of not only how much was paid for the assets but also when those assets were acquired. Thus, for example, in accounting records, all assets acquired in 1967 must be kept separate from assets acquired in 1968. Those assets acquired in 1968 must be kept separate from assets acquired in 1969 and so on.

Also, when any assets are retired or in any other way disposed of, they too must be vintaged. If, for example, they were acquired in 1967, they must be subtracted from the 1967 pool of assets.

Because Consumers Power has surviving depreciable assets acquired as early as in 1900 and in most of the years intervening since then and because the amounts in many cases were relatively small, it did not seem feasible to keep precise account of every year's pool of assets. Also, as was pointed
out earlier, nearly 60 per cent of the dollars Consumers Power had invested in depreciable assets on December 31, 1977 were invested since January 1, 1967. So to make the computations more manageable, all of the depreciable assets Consumers Power held on January 1, 1967 were treated as if they were acquired in 1966. Acquisitions made each year from 1967 through 1977 were vintaged precisely.

In computing UOPP-HC depreciation for Consumers Power, there was one final simplifying FIFO-like assumption. Since Consumers Power said it was not feasible to provide the vintage of the assets retired over the 1967 through 1977 period covered by this study, it was assumed that retirements were retirements of assets in the oldest, i.e., the 1966 pool of assets. Given the average long lives of electric utilities' depreciable assets and the modest amounts of retirements each year, it seems unlikely that this assumption would materially affect the findings.

From Chapter III the basic current-period UOPP-HC depreciation formula is

\[ \text{UOPP-HC Depreciation} = H \times \frac{D_c}{D_a} \times R. \]

A numerical example of how this basic formula was actually applied may be useful in clarifying the computation of UOPP-HC depreciation.

This example, in which all of the dollar data are in thousands, will illustrate the derivation of UOPP-HC depreciation on Consumers' depreciable steam production plant
for the years 1967 and 1968. These are the first two
depreciation amounts in the column headed "UOPP-HC Deprecia-
tion" in Table VIII.

On January 1, 1967, Consumers had $337,247 of depreciable steam production plant. It is this pool of assets that is treated as if all of it were acquired in 1966. During 1967, Consumers added $39,932 and retired $69 of depreciable steam production plant. In 1968, the company added $2,126 and retired $3,715. For the years 1966, 1967, and 1968, the GNP implicit price deflators were 76.76, 79.02, and 82.57, respectively. The same composite depreciation rate, viz., .028001, applies to both 1967 and 1968. Given these data, 1967 UOPP-HC depreciation was computed as follows:

Step 1: Determine the 1967 UOPP-HC amount of the 1966 pool of assets. This is $(337,247 - \frac{69}{2}) \times \frac{79.02}{76.76} = 347,140$.

The $337,247$ is the January 1, 1967 balance that is treated as if all of it were acquired in 1966. The $\frac{69}{2}$ is one-half of $69$ of retirements during 1967. Only one-half of the 1967 retirements was subtracted from the 1966 pool of assets so as to make the UOPP-HC depreciation more directly comparable to both Consumers' actual historical-cost depreciation and to Consumers' UOM-HC depreciation as computed in this study. And, the $\frac{69}{2}$ is subtracted from the 1966 pool of assets because of the FIFO-like assumption explained above. This quantity, i.e., $(337,247 - \frac{69}{2})$, is the $H$ in the basic
formula for the 1966 pool of assets in figuring 1967 UOPP-HC depreciation.

The $D_c$ for this 1966 pool of assets in 1967 is $\frac{79.02}{76.76}$, where 79.02 is the 1967 deflator; 76.76 is the 1966 deflator and the deflator that stays with this 1966 pool of assets in all subsequent computations.

Step 2: Add one-half of the 1967 additions, $19,966 (\frac{39,932}{2})$, to the $347,140. \$347,140 + \$19,966 = \$367,106$. Only one-half of the 1967 additions is added to the UOPP-HC 1966 pool of assets so as to make the UOPP-HC depreciation more directly comparable to both Consumers' actual historical-cost depreciation and to Consumers' UOM-HC depreciation as computed in this study.

The $D_c$ factor for this 1967 pool of assets in 1967 is $\frac{79.02}{79.02}$, i.e., 1. The $D_c$ factor for each current period's additions will always be equal to 1.

Step 3: Multiply the $367,106$, the sum found in Step 2, by the composite depreciation rate that applies to the steam production plant category of assets in 1967, .028001. This .028001 is, of course, the R in the basic formula for computing current-period UOPP-HC depreciation. This multiplication yields 1967 UOPP-HC depreciation of $10,279$. In each succeeding year the 1966 pool of assets gets a little smaller, because of retirements, and a new pool of assets, of the current year's vintage, is added.
UOPP-HC depreciation for 1968 is calculated as follows:

Step 1: Determine the 1968 UOPP-HC amount of the 1966 pool of assets. This is \((337,247 - 69 - \frac{3,715}{2}) \times \frac{82.57}{76.76} = 276.76 \times 82.57 = 360,701\).

The $337,247 is the now familiar January 1, 1967 balance that is treated as if all of it were acquired in 1966. The $69 is all of 1967 retirements. The \(\frac{3,715}{2}\) is one-half of $3,715 retirements during 1968. This quantity, i.e., \((337,247 - 69 - \frac{3,715}{2})\), is the updated \(H\) in the basic formula for the 1966 pool of assets in figuring 1968 UOPP-HC depreciation.

The \(\frac{D_d}{D_a}\) for this 1966 pool of assets in 1968 is \(\frac{82.57}{76.76}\). 82.57 is the 1968 deflator; 76.76 is the 1966 deflator that, as explained above, stays with the 1966 pool of assets in all subsequent computations of UOPP-HC depreciation.

Step 2: Determine the 1968 UOPP-HC amount of the 1967 pool of assets. This is \((39,932 \times \frac{82.57}{79.02}) = 41,726\).

The $39,932 is all of Consumers' additions to its depreciable steam production plant during 1967. It corresponds to the \(H\) in the basic formula for the 1967 pool of assets in figuring 1968 UOPP-HC depreciation.

The 82.57 is the 1968 deflator; 79.02 is the 1967 deflator that stays with the 1967 pool of assets in all subsequent computations of UOPP-HC depreciation. And, for the 1967 pool of assets, the \(\frac{D_d}{D_c}\) corresponds to the \(\frac{D_d}{D_a}\) in the basic UOPP-HC depreciation formula.
Step 3: Add one-half of the 1968 additions, $1,063 (\$2,126), to the results of Steps 1 and 2, viz., $360,701 and $41,726, respectively.

Step 4: Multiply the result of Step 3 ($360,701 + $41,726 + $1,063 = $403,490) by the composite depreciation rate that applied to Consumers' depreciable steam production plant category of assets in 1968, i.e., .028001. Again, this .028001 corresponds to the R in the basic UOPP-HC formula. This Step 4 yields 1968 UOPP-HC depreciation of $11,297.

For each subsequent year, one more step is added. That additional step is necessary to accommodate the pool of assets that is added each year. Also, each year the current year's deflator \(D_c\) changes. This was the procedure used to compute UOPP-HC depreciation on the first seven major categories of Consumers' depreciable assets.

With one change, the UOPP-HC depreciation on transportation equipment was determined the same way as the UOPP-HC depreciation on the seven other major categories of depreciable assets. The one change was in the depreciation rate.

For each of the years 1967 through 1977, the actual annual depreciation that Consumers took on its transportation equipment was divided by the average of the beginning and ending balances in the transportation equipment account for that year. This yielded eleven different rates. The rates ranged from 8.30 per cent to 12.23 per cent and their mean
average was 10.11 per cent. These eleven rates were then applied to each year's transportation equipment asset base arrived at by the same procedure as was used for all of the other depreciable assets.

Because the transportation equipment was depreciated at a significantly faster rate than the other fixed depreciable assets, the FIFO-like assumption pertaining to the vintage of retirements results, by 1977, in the complete elimination of the 1966 and earlier pool of assets, of all of the 1967 acquisitions, and of some of the 1968 acquisitions.

The Results--Broadly

The UOPP-HC depreciation for the Consumers Power Company's total electric plant, derived as explained in the preceding section, is shown in the first column of data in Table VII.

The corresponding UOM-HC depreciation, as computed in this study, is shown in the second column of data in Table VII. These are the same depreciation amounts that are shown in the first column of data in Table VI.

The data in the third column of Table VII show, as a percentage of UOM-HC depreciation, the amount by which UOPP-HC deviates from UOM-HC depreciation. These data and the corresponding data for each of the eight major categories of depreciable assets are probably the most important findings in this study.
<table>
<thead>
<tr>
<th>Year</th>
<th>UOPP-HC Depreciation ($000)</th>
<th>UOM-HC Depreciation ($000)</th>
<th>UOPP-HC Deviation From UOM-HC (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1967</td>
<td>30,171</td>
<td>29,341</td>
<td>+2.83</td>
</tr>
<tr>
<td>1968</td>
<td>33,590</td>
<td>31,388</td>
<td>+7.02</td>
</tr>
<tr>
<td>1969</td>
<td>37,296</td>
<td>33,415</td>
<td>+11.61</td>
</tr>
<tr>
<td>1970</td>
<td>42,511</td>
<td>36,471</td>
<td>+16.56</td>
</tr>
<tr>
<td>1971</td>
<td>46,561</td>
<td>38,442</td>
<td>+21.12</td>
</tr>
<tr>
<td>1972</td>
<td>53,414</td>
<td>43,449</td>
<td>+22.93</td>
</tr>
<tr>
<td>1973</td>
<td>63,069</td>
<td>50,045</td>
<td>+26.02</td>
</tr>
<tr>
<td>1974</td>
<td>73,608</td>
<td>54,521</td>
<td>+35.01</td>
</tr>
<tr>
<td>1975</td>
<td>85,112</td>
<td>58,829</td>
<td>+44.68</td>
</tr>
<tr>
<td>1976</td>
<td>93,419</td>
<td>62,861</td>
<td>+48.61</td>
</tr>
<tr>
<td>1977</td>
<td>103,188</td>
<td>67,209</td>
<td>+53.53</td>
</tr>
</tbody>
</table>

The data in this third column clearly show that each year's UOPP-HC depreciation is greater than that year's corresponding UOM-HC depreciation. In the most recent year, 1977, UOPP-HC depreciation is more than half again the amount of UOM-HC depreciation. Since the UOM-HC depreciation as computed in this study is a reasonable approximation of Consumers' actual depreciation, this is the evidence that at
TABLE VIII
CONSUMERS POWER COMPANY TOTAL STEAM PRODUCTION PLANT UOPP-HC DEPRECIATION COMPARED TO UOM-HC DEPRECIATION 1967-1977

<table>
<thead>
<tr>
<th>Year</th>
<th>UOPP-HC Depreciation ($000)</th>
<th>UOM-HC Depreciation ($000)</th>
<th>UOPP-HC Deviation from UOM-HC (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1967</td>
<td>10,279</td>
<td>10,001</td>
<td>+2.78</td>
</tr>
<tr>
<td>1968</td>
<td>11,297</td>
<td>10,537</td>
<td>+7.21</td>
</tr>
<tr>
<td>1969</td>
<td>11,890</td>
<td>10,570</td>
<td>+12.49</td>
</tr>
<tr>
<td>1970</td>
<td>12,780</td>
<td>10,795</td>
<td>+18.39</td>
</tr>
<tr>
<td>1971</td>
<td>13,562</td>
<td>10,929</td>
<td>+24.09</td>
</tr>
<tr>
<td>1972</td>
<td>14,076</td>
<td>10,947</td>
<td>+28.58</td>
</tr>
<tr>
<td>1973</td>
<td>14,724</td>
<td>10,854</td>
<td>+35.66</td>
</tr>
<tr>
<td>1974</td>
<td>16,138</td>
<td>10,893</td>
<td>+48.15</td>
</tr>
<tr>
<td>1975</td>
<td>21,042</td>
<td>13,802</td>
<td>+52.46</td>
</tr>
<tr>
<td>1976</td>
<td>24,991</td>
<td>16,546</td>
<td>+51.04</td>
</tr>
<tr>
<td>1977</td>
<td>28,901</td>
<td>18,985</td>
<td>+52.23</td>
</tr>
</tbody>
</table>

least during the period 1967 through 1977 there was material underdepreciation in this particular investor-owned electric utility. And since this company is relatively large and in many ways representative of other firms in the electric utility industry, it seems reasonable to argue that over this period the findings summarized in Table VII are cogent
evidence of material underdepreciation in the investor-owned electric utility industry as a whole.

The Results--In Detail

To appreciate the findings of this study more fully, it is necessary to examine individually the depreciation experience of the eight major categories of depreciable assets which make up the total depreciable electric plant. Tables VII through XV show the UOPP-HC depreciation, the UOM-HC depreciation, and the percentage by which UOPP-HC depreciation deviates from UOM-HC depreciation for each of the eight major categories of depreciable assets. The data in these tables are the data from which the highly aggregated data in Table VII came.

In any given year, the differences among the eight major categories of assets in deviations of UOPP-HC depreciation from UOM-HC depreciation are traceable to differences in the patterns, i.e., amounts and timing, of additions to and retirements from each category of assets.

For example, in all of the results, the greatest deviation of UOPP-HC depreciation from UOM-HC depreciation is 62.82 per cent. That is in 1977 in the "Total General Plant" category of assets. (See Table XIV.)

In the UOPP-HC method of computing depreciation, inflation has the least impact on the most recently acquired pools of assets. Because in the total general plant category of assets there were net retirements in 1977, net retirements in
TABLE IX

CONSUMERS POWER COMPANY TOTAL NUCLEAR PRODUCTION PLANT UOPP-HC DEPRECIATION COMPARED TO UOM-HC DEPRECIATION 1967-1977

<table>
<thead>
<tr>
<th>Year</th>
<th>UOPP-HC Depreciation ($000)</th>
<th>UOM-HC Depreciation ($000)</th>
<th>UOPP-HC Deviation From UOM-HC (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1967</td>
<td>705</td>
<td>685</td>
<td>+ 2.92</td>
</tr>
<tr>
<td>1968</td>
<td>740</td>
<td>688</td>
<td>+ 7.56</td>
</tr>
<tr>
<td>1969</td>
<td>781</td>
<td>692</td>
<td>+ 12.86</td>
</tr>
<tr>
<td>1970</td>
<td>490</td>
<td>413</td>
<td>+ 18.64</td>
</tr>
<tr>
<td>1971</td>
<td>524</td>
<td>422</td>
<td>+ 24.17</td>
</tr>
<tr>
<td>1972</td>
<td>2,667</td>
<td>2,543</td>
<td>+ 4.88</td>
</tr>
<tr>
<td>1973</td>
<td>5,267</td>
<td>4,861</td>
<td>+ 8.35</td>
</tr>
<tr>
<td>1974</td>
<td>6,298</td>
<td>5,371</td>
<td>+ 17.26</td>
</tr>
<tr>
<td>1975</td>
<td>7,563</td>
<td>5,942</td>
<td>+ 27.28</td>
</tr>
<tr>
<td>1976</td>
<td>8,115</td>
<td>6,128</td>
<td>+ 32.42</td>
</tr>
<tr>
<td>1977</td>
<td>8,663</td>
<td>6,237</td>
<td>+ 38.90</td>
</tr>
</tbody>
</table>

1976, and immaterial net additions in 1975, there were three (of twelve) pools of assets on December 31, 1977 which combined represented less than 1 per cent of the assets in this category and on which inflation had the least impact. Thus, the nine other pools of assets on which inflation had the most impact contained practically 100 per cent of the assets in this category. It is precisely this pattern of additions
<table>
<thead>
<tr>
<th>Year</th>
<th>UOPP-HC Depreciation ($000)</th>
<th>UOM-HC Depreciation ($000)</th>
<th>UOPP-HC Deviation from UOM-HC (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1967</td>
<td>417</td>
<td>405</td>
<td>+2.96</td>
</tr>
<tr>
<td>1968</td>
<td>431</td>
<td>401</td>
<td>+7.48</td>
</tr>
<tr>
<td>1969</td>
<td>447</td>
<td>397</td>
<td>+12.59</td>
</tr>
<tr>
<td>1970</td>
<td>545</td>
<td>459</td>
<td>+18.74</td>
</tr>
<tr>
<td>1971</td>
<td>568</td>
<td>456</td>
<td>+24.56</td>
</tr>
<tr>
<td>1972</td>
<td>589</td>
<td>455</td>
<td>+29.45</td>
</tr>
<tr>
<td>1973</td>
<td>2,213</td>
<td>2,045</td>
<td>+8.22</td>
</tr>
<tr>
<td>1974</td>
<td>4,174</td>
<td>3,643</td>
<td>+14.58</td>
</tr>
<tr>
<td>1975</td>
<td>3,965</td>
<td>3,160</td>
<td>+25.47</td>
</tr>
<tr>
<td>1976</td>
<td>4,186</td>
<td>3,172</td>
<td>+31.97</td>
</tr>
<tr>
<td>1977</td>
<td>4,436</td>
<td>3,179</td>
<td>+39.54</td>
</tr>
</tbody>
</table>

Intuitively, it might seem that the deviations of UOPP-HC depreciation from UOM-HC depreciation would be smallest
<table>
<thead>
<tr>
<th>Year</th>
<th>UOPP-HC Depreciation ($000)</th>
<th>UOM-HC Depreciation ($000)</th>
<th>UOPP-HC Deviation from UOM-HC (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1967</td>
<td>237</td>
<td>230</td>
<td>+ 3.04</td>
</tr>
<tr>
<td>1968</td>
<td>440</td>
<td>423</td>
<td>+ 4.02</td>
</tr>
<tr>
<td>1969</td>
<td>775</td>
<td>726</td>
<td>+ 6.75</td>
</tr>
<tr>
<td>1970</td>
<td>856</td>
<td>788</td>
<td>+ 8.63</td>
</tr>
<tr>
<td>1971</td>
<td>1,251</td>
<td>1,130</td>
<td>+ 10.71</td>
</tr>
<tr>
<td>1972</td>
<td>1,442</td>
<td>1,268</td>
<td>+13.72</td>
</tr>
<tr>
<td>1973</td>
<td>1,516</td>
<td>1,261</td>
<td>+20.22</td>
</tr>
<tr>
<td>1974</td>
<td>1,664</td>
<td>1,263</td>
<td>+31.75</td>
</tr>
<tr>
<td>1975</td>
<td>2,048</td>
<td>1,420</td>
<td>+44.23</td>
</tr>
<tr>
<td>1976</td>
<td>2,157</td>
<td>1,421</td>
<td>+51.79</td>
</tr>
<tr>
<td>1977</td>
<td>2,285</td>
<td>1,423</td>
<td>+60.58</td>
</tr>
</tbody>
</table>

For transportation equipment, since transportation equipment is depreciated at about three times the rate of practically all of the other depreciable assets. Because the transportation equipment is depreciated at a faster rate, the average age of assets in this major category of assets will be less than the average age of assets in the other seven major categories of assets. Of course the younger the
### TABLE XII

**CONSUMERS POWER COMPANY TOTAL TRANSMISSION PLANT UOPP-HC DEPRECIATION COMPARED TO UOM-HC DEPRECIATION**

1967-1977

<table>
<thead>
<tr>
<th>Year</th>
<th>UOPP-HC Depreciation ($000)</th>
<th>UOM-HC Depreciation ($000)</th>
<th>UOPP-HC Deviation From UOM-HC (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1967</td>
<td>3,994</td>
<td>3,883</td>
<td>+ 2.86</td>
</tr>
<tr>
<td>1968</td>
<td>4,442</td>
<td>4,150</td>
<td>+ 7.04</td>
</tr>
<tr>
<td>1969</td>
<td>5,119</td>
<td>4,599</td>
<td>+ 11.31</td>
</tr>
<tr>
<td>1970</td>
<td>5,893</td>
<td>5,082</td>
<td>+ 15.96</td>
</tr>
<tr>
<td>1971</td>
<td>6,667</td>
<td>5,552</td>
<td>+ 20.08</td>
</tr>
<tr>
<td>1972</td>
<td>7,738</td>
<td>6,342</td>
<td>+ 22.01</td>
</tr>
<tr>
<td>1973</td>
<td>9,162</td>
<td>7,298</td>
<td>+ 25.54</td>
</tr>
<tr>
<td>1974</td>
<td>10,945</td>
<td>8,193</td>
<td>+ 33.59</td>
</tr>
<tr>
<td>1975</td>
<td>11,668</td>
<td>8,137</td>
<td>+ 43.39</td>
</tr>
<tr>
<td>1976</td>
<td>12,548</td>
<td>8,424</td>
<td>+ 48.96</td>
</tr>
<tr>
<td>1977</td>
<td>13,539</td>
<td>8,697</td>
<td>+ 55.67</td>
</tr>
</tbody>
</table>

assets, the smaller the general price level factors that will be applied to those assets in UOPP-HC accounting and the less UOPP-HC depreciation will deviate from UOM-HC depreciation.

A comparison of depreciation deviations for the transportation equipment category of assets (far right column of data in Table XV) with depreciation deviations for total electric plant, the norm (far right column of data in Table VII),
TABLE XIII
CONSUMERS POWER COMPANY TOTAL DISTRIBUTION PLANT UOPP-HC DEPRECIATION COMPARED TO UOM-HC DEPRECIATION 1967-1977

<table>
<thead>
<tr>
<th>Year</th>
<th>UOPP-HC Depreciation ($000)</th>
<th>UOM-HC Depreciation ($000)</th>
<th>UOPP-HC Deviation From UOM-HC (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1967</td>
<td>13,432</td>
<td>13,061</td>
<td>+2.84</td>
</tr>
<tr>
<td>1968</td>
<td>14,905</td>
<td>13,932</td>
<td>+6.98</td>
</tr>
<tr>
<td>1969</td>
<td>16,711</td>
<td>14,991</td>
<td>+11.47</td>
</tr>
<tr>
<td>1970</td>
<td>19,854</td>
<td>17,082</td>
<td>+16.23</td>
</tr>
<tr>
<td>1971</td>
<td>21,914</td>
<td>18,169</td>
<td>+20.61</td>
</tr>
<tr>
<td>1972</td>
<td>24,089</td>
<td>19,509</td>
<td>+23.48</td>
</tr>
<tr>
<td>1973</td>
<td>27,109</td>
<td>21,187</td>
<td>+27.95</td>
</tr>
<tr>
<td>1974</td>
<td>30,958</td>
<td>22,516</td>
<td>+37.49</td>
</tr>
<tr>
<td>1975</td>
<td>34,943</td>
<td>23,583</td>
<td>+48.17</td>
</tr>
<tr>
<td>1976</td>
<td>37,708</td>
<td>24,634</td>
<td>+53.07</td>
</tr>
<tr>
<td>1977</td>
<td>40,912</td>
<td>25,806</td>
<td>+58.54</td>
</tr>
</tbody>
</table>

indicates that, except for 1967, the depreciation deviations for transportation equipment are in fact smaller than normal every year covered in the study.

It might also seem reasonable to expect the depreciation deviations in the transportation equipment category of assets to be less than the depreciation deviations in all of the other individual major categories of assets. However, a
TABLE XIV
CONSUMERS POWER COMPANY TOTAL GENERAL PLANT UOPP-HC DEPRECIATION COMPARED TO UOM-HC DEPRECIATION
1967-1977

<table>
<thead>
<tr>
<th>Year</th>
<th>UOPP-HC Depreciation ($000)</th>
<th>UOM-HC Depreciation ($000)</th>
<th>UOPP-HC Depreciation from UOM-HC (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1967</td>
<td>273</td>
<td>265</td>
<td>+ 3.02</td>
</tr>
<tr>
<td>1968</td>
<td>387</td>
<td>367</td>
<td>+ 5.45</td>
</tr>
<tr>
<td>1969</td>
<td>520</td>
<td>477</td>
<td>+ 9.01</td>
</tr>
<tr>
<td>1970</td>
<td>652</td>
<td>571</td>
<td>+14.19</td>
</tr>
<tr>
<td>1971</td>
<td>714</td>
<td>602</td>
<td>+18.60</td>
</tr>
<tr>
<td>1972</td>
<td>814</td>
<td>677</td>
<td>+20.24</td>
</tr>
<tr>
<td>1973</td>
<td>927</td>
<td>747</td>
<td>+24.10</td>
</tr>
<tr>
<td>1974</td>
<td>1,086</td>
<td>803</td>
<td>+35.24</td>
</tr>
<tr>
<td>1975</td>
<td>1,318</td>
<td>904</td>
<td>+45.80</td>
</tr>
<tr>
<td>1976</td>
<td>1,387</td>
<td>907</td>
<td>+52.92</td>
</tr>
<tr>
<td>1977</td>
<td>1,441</td>
<td>885</td>
<td>+62.82</td>
</tr>
</tbody>
</table>

Comparison of the deviation data for transportation equipment with the deviation data for the other separate categories of assets reveals that this is not the case. Further probing may establish whether this is atypical or not.

During roughly the first half of the period covered in this study, the data seem to confirm intuition. From 1967 to about 1972, depreciation deviations for transportation
TABLE XV

CONSUMERS POWER COMPANY TRANSPORTATION EQUIPMENT UOPP-HC DEPRECIATION COMPARED TO UOM-HC DEPRECIATION 1967-1977

<table>
<thead>
<tr>
<th>Year</th>
<th>UOPP-HC Depreciation ($000)</th>
<th>UOM-HC Depreciation ($000)</th>
<th>UOPP-HC Deviation From UOM-HC (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1967</td>
<td>834</td>
<td>811</td>
<td>+2.84</td>
</tr>
<tr>
<td>1968</td>
<td>948</td>
<td>890</td>
<td>+6.52</td>
</tr>
<tr>
<td>1969</td>
<td>1,053</td>
<td>963</td>
<td>+9.35</td>
</tr>
<tr>
<td>1970</td>
<td>1,441</td>
<td>1,281</td>
<td>+12.49</td>
</tr>
<tr>
<td>1971</td>
<td>1,361</td>
<td>1,182</td>
<td>+15.14</td>
</tr>
<tr>
<td>1972</td>
<td>1,999</td>
<td>1,708</td>
<td>+17.04</td>
</tr>
<tr>
<td>1973</td>
<td>2,151</td>
<td>1,792</td>
<td>+20.03</td>
</tr>
<tr>
<td>1974</td>
<td>2,345</td>
<td>1,839</td>
<td>+27.51</td>
</tr>
<tr>
<td>1975</td>
<td>2,565</td>
<td>1,881</td>
<td>+36.36</td>
</tr>
<tr>
<td>1976</td>
<td>2,327</td>
<td>1,629</td>
<td>+42.85</td>
</tr>
<tr>
<td>1977</td>
<td>3,011</td>
<td>1,997</td>
<td>+50.78</td>
</tr>
</tbody>
</table>

equipment were smaller than depreciation deviations for most of the other major categories of assets.

But for the years 1973 through 1977, the UOPP-HC depreciation deviations from UOM-HC depreciation for the nuclear production plant and the hydraulic production plant—two other major categories of assets and both much larger than transportation equipment—are significantly less than the
depreciation deviations for transportation equipment. A close look at either the nuclear production plant or hydraulic production plant explains why this is the case.

In the most recent year covered by this study, 1977, the smallest deviation of UOPP-HC depreciation from UOM-HC depreciation is in the nuclear production plant category of assets. That deviation, from Table IX, is +38.90 per cent—compared to +53.53 per cent for the total electric plant, from Table VII. Again, this can be traced to the pattern of additions to and retirements from the nuclear production plant category of assets.

Whereas the total electric plant on January 1, 1967 was 41 per cent of the total electric plant on December 31, 1977, the January 1, 1967 balance in the nuclear production plant category of assets was only 7.42 per cent of what the balance was on December 31, 1977. Even five years later, December 31, 1971, the balance in the total nuclear production plant was only 7.25 per cent of what it was on December 31, 1977. With such a large portion of the assets in this category on December 31, 1977 being of very recent vintage, the disparity between 1977 UOPP-HC depreciation and 1977 UOM-HC depreciation was considerably less for nuclear production plant than for total electric plant, for transportation equipment, and for all of the other major categories of depreciable assets individually except hydraulic production plant.
It is also instructive to examine the pattern of UOPP-HC depreciation deviations from UOM-HC depreciation in the nuclear production plant within the 1967 through 1977 period. For the years 1967 through 1971, the pattern (from the far right column of Table IX) of nuclear production plant depreciation deviations is about the same as the pattern of the deviations for total electric plant (from the far right column of Table VII). But with the addition, in 1972, of over $146 million of assets to the nuclear production plant (which contrasts with a January 1, 1972 balance of about $15 million in this category of assets), (1) there is a dramatic decrease from 1971 to 1972, from +24.17 per cent to +4.88 per cent, in the percentage by which UOPP-HC nuclear production plant depreciation deviates from UOM-HC nuclear production plant depreciation; (2) the 1972 deviation in this major category of assets, +4.88 per cent, drops considerably below the 1972 deviation for the company's total electric plant, +22.93 per cent; and (3) from 1972 on the nuclear production plant depreciation deviations lag behind the total electric plant depreciation deviations.

The pattern of depreciation deviations for the hydraulic production plant category of assets is quite similar to the nuclear production plant category. The explanation for the pattern of depreciation deviations in the hydraulic plant is essentially the same as the explanation for the pattern of depreciation deviations in the nuclear plant.
The addition-retirement pattern in Consumers' nuclear and hydraulic production plants during the eleven years covered by this study may indicate that additions to assets with longer average lives are likely to be bunched up. The addition-retirement pattern in Consumers' transportation equipment over this period may indicate that additions to assets with shorter lives are likely to be spread out more evenly.

The shorter average-life-of-asset factor, in itself, tends to narrow UOPP-HC depreciation deviations from UOM-HC depreciation—as the data on transportation equipment in Table XV show. But clearly the bunched up factor, in itself, also tends to narrow UOPP-HC depreciation deviations from UOM-HC depreciation—as the data on nuclear and hydraulic production plants in Tables IX and X show. However, since the bunched up factor is more likely to apply to those categories of assets with longer average lives, in many cases it is probably not possible intuitively to know which depreciation deviation dampening factor will dominate. Thus, it is not possible intuitively to know in which category of depreciable assets there will be the greatest or smallest deviations of UOPP-HC depreciation from UOM-HC depreciation. It is necessary to make a category-by-category investigation. And in this investigation, the average length of life of the assets in any category, alone, tells very little. The average age of the assets in each category tells a great deal.
It then follows that any factor which tends to reduce the average age of assets will tend to narrow the deviation of UOPP-HC depreciation from UOM-HC depreciation. Shorter average asset life is but one such factor. Expansion of operations is another. Changing technology, at least potentially, is a third. As the Consumers Power Company's experience indicates, these factors are normally in a state of flux. First one and then another of the factors may be dominant.

It also follows that any factor which tends to increase the average age of assets will tend to widen the deviations of UOPP-HC depreciation from UOM-HC depreciation. Longer average asset life is but one such factor. Contraction of operations is another. A less rapidly changing or stable technology may be a third. Only by examining the specifics of an actual situation is it possible to determine if one or some combination of these deviation-amplifying factors is dominant or subordinate to the deviation-dampening factors.

For example, the largest single major category of assets for Consumers Power is "Total Distribution Plant." During the last half of the period studied, the depreciation deviations of this very large category of assets (shown in the far right column of Table XIII) are greater than the depreciation deviations of the total electric plant, the norm (shown in the far right column of Table VII). It seems quite plausible that deviation-amplifying factors, such as long average asset
life and relatively less rapidly changing technology, dominated deviation-dampening factors, such as expansion of the total distribution plant.

Summary

In this chapter the UOPP-HC method of determining depreciation was applied to an actual company, the Consumers Power Company of Jackson, Michigan. The method was applied for the period January 1, 1967 through December 31, 1977. During this period the company invested nearly 60 per cent of the total dollars it had invested in depreciable assets on December 31, 1977. Also during this period, inflation was much greater than in any other eleven-year period in modern times.

To keep computations just short of what could be feasibly managed only with a computer, a simplication was made. Rather than using fifty-eight different depreciation rates, as Consumers actually does, on the fifty-eight accounts into which Consumers classifies its total depreciable electric plant, eight weighted composite depreciation rates were used. Each of the weighted composite depreciation rates was applied to one of the eight major categories of assets into which Consumers groups the fifty-eight individual accounts. This simplification gives both the UOM-HC depreciation and the UOPP-HC depreciation computed in this study a small upward bias.
To compute UOPP-HC depreciation, it is necessary to know both when the depreciable assets are acquired and how much is paid for them. Again, to get the numbers down to manageable proportions, it was assumed that all assets held on January 1, 1967 were acquired in 1966. This assumption gives the UOPP-HC depreciation computed in this study a downward bias. Since some of the assets Consumers was using during the 1967 to 1977 period were actually acquired many of the years from 1900 through 1966, it seems quite likely that this assumption which would cause an understatement of UOPP-HC depreciation would more than offset the overstatement due to applying the eight weighted composite depreciation rates to the eight major categories of depreciable assets.

Finally, a FIFO-like assumption was made regarding retirements of the depreciable assets. Since it was not feasible for Consumers to provide the vintage of assets retired, it was assumed that all retirements were made from the oldest of the annual pools of assets. Theoretically, this assumption would also give the UOPP-HC depreciation computed in this study a downward bias. Practically, the assumption probably leads to only a very slight understatement of UOPP-HC depreciation.

Broadly, the results of the study indicate that Consumers' reported depreciation in the most recent years has been only about two-thirds of UOPP-HC depreciation. Specifically, in 1977, Consumers' actual historical-cost depreciation
was $67,265,000 (from Table VI) on its total electric plant. As computed in this study, Consumers' 1977 UOPP-HC depreciation was $103,188,000 (from Table VII). This is empirical evidence of serious underdepreciation in the investor-owned electric utility industry.

More specifically, the results of the study show that, for any given rate of inflation, the average age of assets determines by how much UOPP-HC depreciation deviates from UOM-HC depreciation. And although the average length of life of the assets held is an important factor in the average age of assets, it is not the only factor.

Shorter average asset life, expansion of operations, and changing technology can be major factors that tend to lower the average age of assets. Combined, these factors may narrow the percentage by which UOPP-HC depreciation deviates from UOM-HC depreciation. However, it should be noted at this point that shorter average asset life, by itself, increases the depreciation rate and tends to enlarge the dollar amount by which UOPP-HC depreciation deviates from UOM-HC depreciation.

Longer average asset life, contraction of operations, and a more stable technology can be major factors that tend to raise the average age of assets. Thus, these factors may widen the percentage by which UOPP-HC depreciation deviates from UOM-HC depreciation. So at any given rate of
inflation, it is especially these factors which cause under-depreciation.
CHAPTER V

THE IMPLICATIONS OF UOPP-HC DEPRECIATION
FOR THE INVESTOR-OWNED ELECTRIC
UTILITY INDUSTRY

The purpose of Chapter IV was to explain the application of the UOPP-HC method of determining depreciation to an actual company, to report the results, and to compare UOPP-HC depreciation with depreciation determined by generally accepted accounting principles. In short, the results indicate (1) that over the entire period 1967 through 1977, Consumers Power Company's total reported depreciation on its electric plant was about 75 per cent of total UOPP-HC depreciation as computed in this study and (2) that in 1977, the most recent year examined, the company's reported depreciation on its electric plant was about 65 per cent of 1977 UOPP-HC depreciation. The purpose of this chapter is to consider the implications, for the investor-owned electric utility industry as well as Consumers Power, of this material under-depreciation.

Net Income

The purpose of Table XVI is to show what the impact of using UOPP-HC depreciation instead of UOM-HC depreciation
## TABLE XVI

**THE CONSUMERS POWER COMPANY—ELECTRIC OPERATIONS 1977 INCOME STATEMENTS—ACTUAL AND INCORPORATING UOPP-HC DEPRECIATION ($000)**

<table>
<thead>
<tr>
<th>Description</th>
<th>Actual</th>
<th>Incorporating UOPP-HC Depreciation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating revenues</td>
<td>908,963</td>
<td>908,963</td>
</tr>
<tr>
<td>Operating expenses</td>
<td>585,669</td>
<td>585,669</td>
</tr>
<tr>
<td>Depreciation and amortization</td>
<td>67,265</td>
<td>103,188</td>
</tr>
<tr>
<td>Amortization utility plant acquisition adjustment</td>
<td>48</td>
<td>48</td>
</tr>
<tr>
<td>Taxes</td>
<td>29,483</td>
<td>29,483</td>
</tr>
<tr>
<td>Deferred investment tax credit</td>
<td>44,164</td>
<td>44,164</td>
</tr>
<tr>
<td>Deferred federal income tax provision</td>
<td>19,461</td>
<td>19,461</td>
</tr>
<tr>
<td><strong>Total electric operating revenue deductions</strong></td>
<td>746,090</td>
<td>782,013</td>
</tr>
<tr>
<td><strong>Total electric net operating income</strong></td>
<td>162,873</td>
<td>126,950</td>
</tr>
<tr>
<td>Allowance for other funds used during construction</td>
<td>30,444</td>
<td>30,444</td>
</tr>
<tr>
<td>Other income, net</td>
<td>16,651</td>
<td>16,651</td>
</tr>
<tr>
<td><strong>Net other income and deductions</strong></td>
<td>47,095</td>
<td>47,095</td>
</tr>
<tr>
<td>Gross income</td>
<td>209,968</td>
<td>174,045</td>
</tr>
<tr>
<td>Interest on long-term debt</td>
<td>102,483</td>
<td>102,483</td>
</tr>
<tr>
<td>Allowance for borrowed funds used during construction</td>
<td>(18,538)</td>
<td>(18,538)</td>
</tr>
<tr>
<td>Amortization of debt discount and expense</td>
<td>556</td>
<td>556</td>
</tr>
<tr>
<td>Amortization of premium on debt</td>
<td>(133)</td>
<td>(133)</td>
</tr>
<tr>
<td>Other interest charges</td>
<td>438</td>
<td>438</td>
</tr>
<tr>
<td><strong>Total interest charges</strong></td>
<td>84,806</td>
<td>84,806</td>
</tr>
<tr>
<td><strong>Net income</strong></td>
<td>125,162</td>
<td>89,239</td>
</tr>
<tr>
<td>Preferred dividends</td>
<td>19,841</td>
<td>19,841</td>
</tr>
<tr>
<td>Preference dividends</td>
<td>7,137</td>
<td>7,137</td>
</tr>
<tr>
<td>Common dividends, cash</td>
<td>60,735</td>
<td>60,735</td>
</tr>
<tr>
<td><strong>Total dividends</strong></td>
<td>87,713</td>
<td>87,713</td>
</tr>
</tbody>
</table>

would be on Consumers Power Company's 1977 income statement, given the UOPP-HC depreciation results cited in Chapter IV. The first income statement in Table XVI is consumers' actual 1977 income statement with several modifications. The modifications were necessary because (1) this study is confined to the electric operations of Consumers Power Company and to the investor-owned electric utilities generally and (2) Consumers Power, which has both electric and natural gas operations, does not make an electric-gas separation of all of the data on its income statement.

Specifically, all of the data from "Operating revenues" down through "Total electric net operating income" are taken directly from reports filed with the Federal Regulatory Commission. The $30,444,000 "Allowance for other funds used during construction" was also taken from these reports intact. The allowance for funds used during construction was not modified because, "Substantially all of the AFUDC related to electric plant construction."¹

However, the amounts for "Other income, net," all of the items contained in "total interest charges," and the cash dividends paid on all three classes of stock are 78 per cent of the amounts reported in 1977 under these headings. Seventy-eight per cent was used because on December 31, 1977, Consumers' net electric plant was 78 per cent of its total

¹Note 9, Notes to Financial Statements, Consumers Power Company 1977 Annual Report, p. 29.
net utility plant. In other words, because other income, the interest expense items, and cash dividends pertain to total assets, these items were allocated to electric operations in the proportion that net electric plant bore to total net utility plant at the end of 1977.

Taking 78 per cent of the reported amounts for 1977 "Other income, net" and "Total interest charges" yields $16,651,000 and $84,806,000, respectively. Thus, as the first income statement (headed "Actual") in Table XVI shows, Consumers' 1977 actual net income from electric operations was $125,162,000. Taking 78 per cent of the reported amounts for cash dividends paid in 1977 on the preferred, preference, and common stock yields $19,841,000, $7,137,000 and $60,735,000, respectively.

The second income statement (headed "Incorporating UOPP-HC Depreciation") in Table XVI is Consumers' 1977 income statement using UOPP-HC depreciation of $103,188,000 from Table VII in Chapter IV. With this change from UOM-HC depreciation to UOPP-HC depreciation, 1977 net income from electric operations falls significantly—from $125,162,000 to $89,239,000. Note also that there does not appear to be any ready relief from this significant decline in net income.

The operating efficiencies and concomitant cost savings mentioned in many annual reports in footnotes pertaining to replacement cost data (discussed in Chapter III) are simply not a possibility in the UOPP-HC method of accounting. As
long as only UOM-HC is recognized for tax purposes, federal income taxes will not be any lower. It is difficult to know for certain what impact using UOPP-HC depreciation would have on the interest rates Consumers Power is obliged to pay on its debt.

On December 31, 1977, excluding its pollution control revenue bonds, Consumers Power had thirty-two different issues of bonds outstanding. Of these thirty-two issues, two were not rated because they were privately held. Moody's rated one issue Baa and twenty-nine issues A. Moody's key to its bond rating says this about an A rating,

Bonds which are rated A possess many favorable investment attributes and are to be considered as upper medium grade obligations. Factors giving security to principal and interest are considered adequate but elements may be present which suggest a susceptibility to impairment sometime in the future.

As the data in the 1977 income statement incorporating UOPP-HC depreciation in Table XVI indicate and as explained in greater detail in the following section, Consumers' "real" retained earnings in 1977 were practically nil. This increases risk for the company's creditors—and for the company's stockholders, of course. The increased risk revealed in the 1977 income statement that incorporates UOPP-HC depreciation raises some question about whether factors giving security to principal and interest should, in fact, be considered adequate. The future in the "susceptibility to impairment sometime in the future" appears to have arrived. If Consumers' bonds are
overrated, Consumers’ interest costs are probably lower than they would be if those securities were accurately rated.

Still, since the bulk of Consumers’ long-term debt is probably held by sophisticated investors, it seems quite likely that these investors recognize the risks revealed in the 1977 income statement that incorporates UOPP-HC depreciation. Of course if Consumers’ creditors are fully aware of these risks, Consumers’ interest costs already reflect those risks.

Whether Consumers’ bonds are overrated by Moody’s or correctly judged by investors may be indeterminant. But in either case, it seems most unlikely that Consumers could realistically expect relief from the pressure that UOPP-HC depreciation puts on its net income through lower interest costs.

In sum, to dampen the significant fall in its net income when using UOPP-HC depreciation instead of UOM-HC depreciation, Consumers Power probably cannot expect to find quick relief in savings in operating costs, lower income taxes or lower interest rates.

Dividend Payout Ratio

A little study of these two income statements quickly reveals that using UOPP-HC depreciation instead of UOM-HC depreciation has other significant consequences. The dividend payout ratio, for example, is one of the more apparent.
With a net income of $125,162,000, according to the actual income statement, and cash dividends aggregating $87,713,000, Consumers appears to have a payout ratio of 70 per cent. But with a net income of $89,239,000 according to the income statement that incorporates UOPP-HC depreciation, and total cash dividends of $87,713,000, Consumers actually has a payout ratio of slightly over 98 per cent.

Recall from Chapter IV that Consumers invested about 40 per cent of the total dollars it had invested in depreciable assets on December 31, 1977 over many of the years from 1900 through 1966. But all of these depreciable assets were treated as if they were acquired in 1966. This treatment of 1900 through 1966 acquisitions probably results in a net understatement of the UOPP-HC depreciation on Consumers' depreciable plant.

Since Consumers had a dividend payout ratio of over 98 per cent before allowance is made for the probable understatement of UOPP-HC depreciation, it seems very likely that Consumers had no retained earnings in 1977. In fact, it is quite possible that Consumers even paid out some of its capital in 1977.

This conclusion is one bit of empirical evidence that "today . . . 'the high levels of private and public consumption seem to exceed what the industrial machine can provide'
and are 'made possible largely by eating into the capital stock' and deferring maintenance and replacement."²

Accelerating Decapitalization

It is coincidental that Consumers' aggregate 1977 cash dividends just about equal the 1977 net income based on UOPP-HC depreciation. Data from Table VII, specifically the fourth column which shows the percentage by which UOPP-HC depreciation deviates from UOM-HC depreciation, show that each year's deviation is greater than the previous year's. If this trend in deviations of UOPP-HC depreciation from UOM-HC depreciation were to continue, future net income based on UOPP-HC depreciation would be progressively less than future net income based on UOM-HC depreciation. It would then follow that if future cash dividends bore the same relationship to reported net income that they have in the past, those cash dividends would exceed future net income based on UOPP-HC depreciation by ever wider margins. And, an ever larger percentage of the cash dividends would, in effect, represent payments of capital to stockholders. This is a vital issue.

This possibility would be the actuality if each future year's deviation of UOPP-HC depreciation from UOM-HC depreciation were greater than the previous year's. Thus, it is

²Article in June 25, 1979 Wall Street Journal by Richard J. Levine in which he quotes Columbia University sociologist Amitai Etzioni.
important to ascertain the pattern of future year's deviations of UOPP-HC depreciation from UOM-HC depreciation.

Table XVII is basically an extension of Table VII from Chapter IV. Over the period 1967 through 1977, the annual additions Consumers Power made to its depreciable electric plant averaged 9.49 per cent of the total depreciable electric plant it owned at the beginning of each of those eleven years. Annual retirements of depreciable electric plant averaged 1.10 per cent of total depreciable electric plant owned at the beginning of each year. Thus, in generating the data in Table XVII, it was assumed that over the period shown in the table, 1978 through 1990, Consumers added and retired depreciable electric plant at these same rates.

Since the average annual compound rate of inflation over the period 1967 through 1977 was about 6 per cent, 6 per cent was also used as the annual compound rate of inflation over the period 1978 through 1990.

UOPP-HC depreciation and UOM-HC depreciation were then computed for the period 1978 through 1990 the same way they were computed for the period 1967 through 1977. The results are shown in the second and third columns of Table XVII.

As did the fourth column in Table VII, the fourth column of Table XVII also shows the percentage by which UOPP-HC depreciation deviates from UOM-HC depreciation each year. These data show that, at least under the specified assumptions,
<table>
<thead>
<tr>
<th>Year</th>
<th>UOPP-HC Depreciation ($000)</th>
<th>UOM-HC Depreciation ($000)</th>
<th>UOPP-HC Deviation From UOM-HC (%)</th>
<th>Difference Between Deviations (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1978</td>
<td>113,476</td>
<td>71,942</td>
<td>+ 57.73</td>
<td>3.49</td>
</tr>
<tr>
<td>1979</td>
<td>125,720</td>
<td>77,978</td>
<td>+ 61.22</td>
<td>3.31</td>
</tr>
<tr>
<td>1980</td>
<td>139,059</td>
<td>84,520</td>
<td>+ 64.53</td>
<td>3.10</td>
</tr>
<tr>
<td>1981</td>
<td>153,568</td>
<td>91,612</td>
<td>+ 67.63</td>
<td>2.89</td>
</tr>
<tr>
<td>1982</td>
<td>169,318</td>
<td>99,298</td>
<td>+ 70.52</td>
<td>2.69</td>
</tr>
<tr>
<td>1983</td>
<td>186,426</td>
<td>107,629</td>
<td>+ 73.21</td>
<td>2.48</td>
</tr>
<tr>
<td>1984</td>
<td>204,953</td>
<td>116,659</td>
<td>+ 75.69</td>
<td>2.25</td>
</tr>
<tr>
<td>1985</td>
<td>224,999</td>
<td>126,447</td>
<td>+ 77.94</td>
<td>2.06</td>
</tr>
<tr>
<td>1986</td>
<td>246,644</td>
<td>137,026</td>
<td>+ 80.00</td>
<td>1.82</td>
</tr>
<tr>
<td>1987</td>
<td>270,053</td>
<td>148,525</td>
<td>+ 81.82</td>
<td>1.55</td>
</tr>
<tr>
<td>1988</td>
<td>295,251</td>
<td>161,017</td>
<td>+ 83.37</td>
<td>1.34</td>
</tr>
<tr>
<td>1989</td>
<td>322,353</td>
<td>174,523</td>
<td>+ 84.71</td>
<td>1.08</td>
</tr>
<tr>
<td>1990</td>
<td>351,457</td>
<td>189,164</td>
<td>+ 85.79</td>
<td></td>
</tr>
</tbody>
</table>
each year's deviation of UOPP-HC depreciation from UOM-HC depreciation is greater than the previous year's. And thus if in the future Consumers Power maintains the cash dividend to reported net income ratio that it has had in the past, an ever larger percentage of those cash dividends will, in effect, be payments of capital.

The data in the fifth column of Table XVII show the results of the final step of this analysis. Each number is simply the difference between the depreciation deviations for two consecutive years. Each number shows the amount by which each year's deviation of UOPP-HC depreciation from UOM-HC depreciation is greater than the previous year's deviation. These data show that, again at least under the specified assumptions, there would be a decrease in the rate of increase in the percentage by which future UOPP-HC depreciation would deviate from UOM-HC depreciation.

In sum, only a small portion of the cash dividends Consumers Power paid in 1977 was probably in substance a payment of capital. But the hypothetical data developed in this section indicate that in future years ever larger portions of the company's cash dividends will represent payments of capital, if the company maintains its past dividend to reported net income payout ratio. This is probably the most ominous finding in this entire study. Finally, the data indicate that over time there will be a
decrease in the rate at which the portions of cash dividends that represent payments of capital get larger.

Still Faster Decapitalization

Of the assumptions underlying the data in Table XVII, the 6 per cent annual compound rate of inflation is probably the least tenable. Actual experience in the early part of the 1978 through 1990 period indicates that the average annual inflation rate may very well be closer to double the assumed 6 per cent. Thus, to get what is probably a more realistic view of future disparities between UOPP-HC depreciation and UOM-HC depreciation, the data in Table XVIII were generated on the assumption that the average annual compound rate of inflation from 1978 through 1990 will be 12 per cent.3

3Assuming a 12 per cent average annual inflation rate for the period 1978 through 1990 is probably more realistic than assuming a 6 per cent for the following, among other reasons:

(1) As measured by the gross national product implicit price deflator, the actual rates of inflation in 1978 and 1979 were 7.4 per cent and 10.9 per cent, respectively.

(2) Probably more than any other single factor, monetizing federal government deficits causes inflation. Incumbent Presidents or those who aspire to the presidency may talk about reducing those deficits and even about balancing the federal government's budget. But when it gets down to specific cuts in expenditures, these remarks by Agriculture Secretary Robert Bergland as quoted in the March 6, 1980 issue of the Midland (Michigan) Daily News are fairly typical. These remarks were made in response to President Carter's request that the United States Department of Agriculture cut its expenditures by $800 million, $800 million being the Agriculture Department's share of the total reduction in spending that President Carter wants from federal agencies in an effort to balance the 1981 budget.
It was again assumed that annual additions to depreciable electric plant were 9.49 per cent and retirements 1.10 per cent of the total UOM-HC depreciable electric plant owned at the beginning of each year. If the annual rate of inflation were 12 per cent, this assumption regarding additions and retirements would probably understate the dollar amounts of the additions and retirements. That understatement, in turn, would lead to an understatement of both UOPP-HC depreciation and UOM-HC depreciation. But since the focus in this analysis is on the difference between UOPP-HC depreciation and UOM-HC depreciation, an error in the assumptions regarding future additions and retirements is probably less significant than at first blush it might appear.

"It's a painful, bloody, difficult process because people are accustomed to what they've been getting and don't want to give it up. . . . [Cutting the USDA's budget] is quite a lot easier said than done, because between 75 per cent and 80 per cent of our budget is either indexed or is on an entitlement basis. . . . If we completely dismantled all the so-called controllable programs, I mean, just abolish them wholesale, we could do it. But I don't think that's advisable . . . we don't think it's politically feasible."

In this same vein, the author of "The Coming Change in Policy: Basic or Cosmetic?" in the March, 1980 issue of The Morgan Guaranty Survey observes, "The tough and unpleasant task of scaling back individual parts of the budget to achieve a responsible total has been sidestepped. Essentially, the Administration and Congress have acquiesced in the powerful inflation that has emerged."

(3) The United States currently has a fiat money system. The historical record of success in controlling inflation under fiat money systems is not good.
### TABLE XVIII

**CONSUMERS POWER COMPANY PROJECTED TOTAL ELECTRIC PLANT UOPP-HC DEPRECIATION COMPARED TO UOM-HC DEPRECIATION AT 12 PER CENT INFLATION 1978-1990**

<table>
<thead>
<tr>
<th>Year</th>
<th>UOPP-HC Depreciation ($000)</th>
<th>UOM-HC Depreciation ($000)</th>
<th>UOPP-HC Deviation From UOM-HC (%)</th>
<th>Difference Between Deviations (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1978</td>
<td>119,463</td>
<td>71,942</td>
<td>+ 66.05</td>
<td>12.45</td>
</tr>
<tr>
<td>1979</td>
<td>139,188</td>
<td>77,978</td>
<td>+ 78.50</td>
<td>12.57</td>
</tr>
<tr>
<td>1980</td>
<td>161,494</td>
<td>84,520</td>
<td>+ 91.07</td>
<td>12.68</td>
</tr>
<tr>
<td>1981</td>
<td>186,657</td>
<td>91,612</td>
<td>+103.75</td>
<td>12.74</td>
</tr>
<tr>
<td>1982</td>
<td>214,974</td>
<td>99,298</td>
<td>+116.49</td>
<td>12.78</td>
</tr>
<tr>
<td>1983</td>
<td>246,759</td>
<td>107,629</td>
<td>+129.27</td>
<td>12.76</td>
</tr>
<tr>
<td>1984</td>
<td>282,344</td>
<td>116,659</td>
<td>+142.03</td>
<td>12.68</td>
</tr>
<tr>
<td>1985</td>
<td>322,073</td>
<td>126,447</td>
<td>+154.71</td>
<td>12.61</td>
</tr>
<tr>
<td>1986</td>
<td>366,296</td>
<td>137,026</td>
<td>+165.32</td>
<td>12.34</td>
</tr>
<tr>
<td>1987</td>
<td>415,370</td>
<td>148,525</td>
<td>+179.66</td>
<td>12.01</td>
</tr>
<tr>
<td>1988</td>
<td>469,638</td>
<td>161,017</td>
<td>+191.67</td>
<td>11.68</td>
</tr>
<tr>
<td>1989</td>
<td>529,424</td>
<td>174,523</td>
<td>+203.35</td>
<td>11.20</td>
</tr>
<tr>
<td>1990</td>
<td>595,016</td>
<td>189,164</td>
<td>+214.55</td>
<td></td>
</tr>
</tbody>
</table>
Lastly, the data generated in Table XVIII were developed a bit more precisely than the data in Table XVI in one final respect, viz., in the handling of the current year retirements. As explained in Chapter IV, Consumers Power includes in its depreciable asset base one-half of the current year's additions to depreciable electric plant and equipment and excludes one-half of the current year's retirements of depreciable electric plant and equipment. The depreciable asset base from which both the UOPP-HC depreciation and the UOM-HC depreciation shown in Table XVII were derived excluded one-half of the current year's retirements quoted in terms of UOM-HC. In computing the UOPP-HC depreciation shown in Table XVIII, this simplification was not made. In computing the UOM-HC depreciation shown in Table XVIII the one-half of the current year's retirements excluded from the depreciable asset base was quoted in UOM-HC. But in computing the UOPP-HC depreciation shown in Table XVIII, the one-half of the current year's retirements excluded from the depreciable asset base was quoted in UOPP-HC.

The impact of the absence of, in the case of the data in Table XVII, or the presence of, in the case of the data in Table XVIII, this greater rigor in computations is probably inconsequential. However, both the 12 per cent rate of inflation assumption and the more precise computations of UOPP-HC depreciation contribute to a more realistic preview of one very important facet of the Consumer Power
Company's financial future than the preview given in Table XVII.

Intuitively, it would seem likely that a higher rate of inflation would amplify the results reported in Table XVII. A comparison of the deviations of UOPP-HC depreciation from UOM-HC depreciation shown in Table XVIII with the corresponding deviations shown in Table XVII confirms that this is the case. Still, it is instructive to note by how much a 12 per cent inflation rate amplifies the deviations projected with a 6 per cent inflation rate.

At a 6 per cent inflation rate Table XVII shows that by 1990 UOPP-HC depreciation would be about 86 per cent greater than UOM-HC depreciation. But at the 12 per cent inflation rate Table XVIII shows that UOPP-HC depreciation would be more than 86 per cent greater than UOM-HC depreciation as early as 1980, ten years sooner! At the 12 per cent inflation rate, UOPP-HC depreciation would be more than triple UOM-HC depreciation in 1990. Clearly, a 12 per cent inflation rate would drastically accelerate Consumers' experiencing the cited effects of a 6 per cent inflation rate and then proceed much further to amplify those effects.

Finally, column five of Table XVIII shows that there is a very small acceleration, from 1978 through 1983, and then a modest deceleration, from 1983 through 1990, in the year-to-year rate of increase in the deviations of UOPP-HC depreciation from UOM-HC depreciation. Although it is of relatively
minor consequence, it is interesting to note that the deceleration in the increase in deviations of UOPP-HC depreciation from UOM-HC depreciation from 1983 through 1990 shown in column five of Table XVIII is not as rapid as the deceleration in the increase in deviations from 1978 through 1990 shown in column five of Table XVII. Thus down to every detail a 12 per cent inflation rate is more oppressive than a 6 per cent inflation rate.

In short, to assume a future annual inflation rate of 12 per cent is probably much more realistic than to assume a future inflation rate of 6 per cent. With a 12 per cent inflation rate, UOPP-HC depreciation would deviate from UOM-HC depreciation even further than with a 6 per cent inflation rate—much further. If Consumers Power were to maintain its past dividend to reported net income payment ratio under these circumstances, it would decapitalize itself at a still faster rate than it would if inflation were held down to 6 per cent per year.

Sources of Funds

The finding that Consumers Power probably had no retained earnings in 1977 and in fact may even have paid out some of its capital should be tied in with Chapter I—specifically with Figure 3, Sources of Funds of Investor-Owned Electric Utilities and with Figure 4, Depreciation and Retained Earnings as a Percentage of Total Sources of Funds of Investor-Owned Electric Utilities. Figures 3 and 4
purportedly show the extent of the investor-owned electric utilities' dependence on external sources of funds and the respective contributions of depreciation and retained earnings to total internally generated funds. But these figures are based on data comparable to the data in the actual income statement in Table XVI.

Based on the data in the actual income statement in Table XVI, the internal sources of funds depreciation and retained earnings provided $67,265,000 and $37,714,000, respectively, in 1977. That is a total of $104,714,000.

Based on the data in the second income statement in Table XVI, the internal sources of funds depreciation and retained earnings provided $103,188,000 and $1,526,000, respectively, in 1977. That is also a total of $104,714,000.

In sum, given the way the second income statement in Table XVI was developed, viz., UOPP-HC depreciation was substituted for UOM-HC depreciation, there is no change in the total funds provided by depreciation and retained earnings combined. If Figure 3 in Chapter I were based on data such as that in the second income statement in Table XVI, it would look no differently.

However, there is a significant change in the composition of those internal sources of funds. With UOM-HC depreciation, depreciation provides 64 per cent and retained earnings provide 36 per cent of the funds generated by these two internal sources of funds in 1977. With UOPP-HC depreciation,
depreciation provides 99 per cent and retained earnings provide 1 per cent of the funds generated by these two internal sources of funds.

After allowing for the probable understatement of UOPP-HC depreciation due to treating all depreciable assets acquired from 1900 through 1966 as if they were acquired in 1966, it probably took more than all of the net income to pay the cash dividends on the preferred, preference, and common stock in 1977. That "more" is a portion of the funds recovered through depreciation. And it is that portion of funds recovered through depreciation, though likely quite small at this particular point in the illustration, that is in substance a return of capital to the stockholders. So if Figure 4 in Chapter I were based on data such as that in the second income statement in Table XVI, it would look very different.

Effective Tax Rate

Using UOPP-HC depreciation instead of UOM-HC depreciation also has a significant impact on Consumers' effective federal income tax rate. Given the form of the data in the income statements in Table XVI, Consumers' effective federal income tax rate can be found by dividing the sum of "Deferred investment tax credit" and "Deferred federal income tax provision" by the quantity "Total electric net operating income" plus "Net other income and deductions" plus "Deferred investment tax credit" plus "Deferred federal income tax provision" minus "Total interest charges." Using the actual data in the
first income statement, the effective federal income tax rate is 34 per cent. Using the data incorporating UOPP-HC depreciation from the second statement, the effective federal income tax rate is 42 per cent, i.e., nearly 25 per cent higher than the actual data indicate.

Generalizing from Consumers' Situation

Up to this point, this chapter has covered some of the major implications of UOPP-HC depreciation for a specific company, Consumers Power Company of Jackson Michigan. The purpose of this section of the chapter is to determine to what extent the implications of UOPP-HC depreciation for Consumers are also the implications of UOPP-HC depreciation for the investor-owned electric utility industry as a whole. In other words, can the findings from the application of UOPP-HC depreciation to Consumers be generalized?

In pursuing the answer to this question, one approach is to start with operating revenues and to trace what happens to them. Figure 19 shows what percentage electric plant depreciation expense was of electric operating revenues for Consumers Power and for the investor-owned electric utility industry as a whole each year for the period 1970 through 1977. The figure shows a fairly steady difference between Consumers and the industry. For each $100 of electric operating revenues, Consumers has been regularly recovering approximately $1 less in depreciation than other electric utilities. In the
most recent year shown, 1977, Consumers recovered $7.37 in
depreciation for each $100 of electric operating revenues
whereas the industry recovered $8.41 in depreciation for
each $100 of electric operating revenues. Thus, in this
respect Consumers has not been doing as well as electric
utilities generally in recouping the capital that, according
to UOM-HC depreciation figures, is being consumed in the
process of providing the electricity produced.

Retained earnings are perhaps the most useful single
measure of what leeway Consumers has. For if for each $100
of electric operating revenues Consumers had $1 more in
retained earnings than the industry as a whole, that $1 might
serve to offset the $1 depreciation shortfall.

Figure 20 shows what percentage Consumers' and the
investor-owned electric utility industry's retained earnings
from all operations were of all operating revenues each year
for the period from 1970 through 1977. The figure shows that
Consumers did not have retained earnings greater than the
industry average to offset its below industry average recovery
of capital through depreciation. In fact, the figure shows
that, at least over the 1970 through 1977 period, Consumers
consistently retained a lower percentage of its revenue
dollars than did the investor-owned electric utilities as a
whole. Thus, by this second measure, percentage of total
operating revenues that wind up as retained earnings,
Consumers Power is also weaker than other electric utilities.
Fig. 20--Retained earnings as a percentage of total operating revenues for Consumers Power and the electric utility industry, 1970-1977. Sources: Edison Electric Institute Statistical Yearbook; Moody's Public Utilities Manual, 1978.
Of course there are ways Consumers might compensate for both its below average capital recovery through UOM-HC depreciation and its below average retained earnings. One such way would be to have above average borrowing capacity.

Table XIX summarizes for 1977, the most recent year covered in this study, the capitalization ratios of Consumers Power and all investor-owned electric utilities. The data show that Consumers, relative to the industry, has no unused borrowing capacity. In fact, if the company is to stay within industry norms, the company's next financing clearly ought to be equity financing.

### TABLE XIX

**CAPITALIZATION RATIOS--CONSUMERS POWER COMPANY AND ALL INVESTOR-OWNED ELECTRIC UTILITIES 1977**

<table>
<thead>
<tr>
<th>Description</th>
<th>Consumers Power</th>
<th>Investor-Owned Electric Utilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Long-Term Debt</td>
<td>52.2%</td>
<td>51.0%</td>
</tr>
<tr>
<td>Preferred and Preference Stock</td>
<td>14.4</td>
<td>12.5</td>
</tr>
<tr>
<td>Common Stockholders' Equity</td>
<td>34.4</td>
<td>36.5</td>
</tr>
<tr>
<td>Total Capitalization</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
</tbody>
</table>


Note, however, that even if Consumers Power did have above average borrowing capacity, this capacity would provide only a short-run, stop-gap offset to its below average capital
recovery since it would disappear as the reserve margin of borrowing power was used up.

Thus, by at least the three measures examined, (1) the percentage electric plant depreciation expense is of electric operating revenues, (2) the percentage of all operating revenues that wind up as retained earnings and (3) unused borrowing capacity, Consumers Power is in a weaker position than the average investor-owned electric utility. Since Consumers is in a weaker position than the average electric utility, it raises the crucial question, by how much is the impact of UOPP-HC depreciation on the industry distorted when it is judged by its impact on Consumers Power Company? A few simple comparisons will help answer this crucial question.

From Figure 19, recall that over the period from 1970 through 1977 the investor-owned electric utility industry as a whole annually recovered in depreciation about $1 more than Consumers Power per $100 of electric operating revenues. In 1977 specifically, the industry recovered $8.41 when Consumers recovered $7.37. But as data in the second income statement in Table XVI show, Consumers would have recovered $11.35 per $100 of electric operating revenues if it had used UOPP-HC depreciation in 1977. So although Consumers' UOM-HC depreciation was about $4 short of UOPP-HC depreciation, even the industry average UOM-HC depreciation was about
$3 short of UOPP-HC depreciation for each $100 of electric operating revenues.

Put another way, if Consumers' UOM-HC depreciation had been at the same level as the industry's average, Consumers would have claimed $76,444,000 UOM-HC depreciation in 1977 as opposed to the $67,265,000 the company actually claimed. And, whereas the 1977 UOPP-HC depreciation was 53 per cent greater than the depreciation Consumers actually claimed in 1977, UOPP-HC depreciation would still have been 35 per cent greater than the depreciation Consumers would have claimed in 1977 had it claimed UOM-HC depreciation at the industry average rate that year.

Also recall that over the 1970 through 1977 period the investor-owned electric utility industry's retained earnings averaged $3.86 for each $100 of total operating revenues. Consumers' total retained earnings averaged $2.32 for each $100 of total operating revenues. This is an average annual difference of $1.54. This $1.54 average annual difference between Consumers' and the industry's total retained earnings for each $100 of total operating revenues is about 60 per cent of the $2.60 retained earnings per $100 of total revenues that Consumers reportedly had in 1977. This contrasts with the probable complete elimination, and a little more, of Consumers' retained earnings attributable to electric operations when UOPP-HC depreciation on the company's electric plant is used instead of UOM-HC depreciation on that electric plant, as the
data in the income statements in Table XVI and the treatment of 1900 through 1966 asset acquisitions indicate.

Perhaps one final comparison, of UOPP-HC depreciation to debt, will provide some more of the answer to the crucial question, by how much is the impact of UOPP-HC depreciation on the investor-owned electric utility industry distorted when it is judged by its impact on Consumers Power Company alone?

On December 31, 1977 Consumers' total long-term debt was $1,815,671,000. As explained earlier in this chapter, about 78 per cent of this total is applicable to Consumers' net electric plant. Seventy-eight per cent of the total is $1,416,223,000. The $35,923,000 by which Consumers' 1977 UOPP-HC depreciation exceeded the company's 1977 UOM-HC depreciation is 2.54 per cent of the $1,416,223,000 of Consumers' long-term debt applicable to its net electric plant. The $35,923,000 by which Consumers' 1977 UOPP-HC depreciation exceeded the company's 1977 UOM-HC depreciation is 1.03 per cent of Consumers' total, electric and gas, December 31, 1977 capitalization. This suggests that, in a real sense, about 1 per cent per year of the company's capital is being "given" to its customers through underpricing of electric service.

The 2.54 per cent gives some useful perspective in relating UOPP-HC depreciation to debt. But although the
2.54 per cent is not, the 1.03 per cent is directly comparable to the 1.2 per cent spread between the 52.2 per cent that long-term debt was of Consumers' December 31, 1977 total capitalization and the 51.0 per cent that long-term debt was of the entire investor-owned electric utilities' total capitalization in 1977.

The purpose of this section of Chapter V has been to determine to what extent the implications of UOPP-HC depreciation for Consumers Power Company are also the implications of UOPP-HC depreciation for the investor-owned electric utility industry as a whole.

The evidence cited indicates that by some important measures Consumers is a weaker company than the average investor-owned electric utility. For this reason, the impact of UOPP-HC depreciation on Consumers is greater than it would be on the average electric utility. However, the impact of UOPP-HC is so great that, by all three measures used, it is clear that UOPP-HC depreciation would have a very significant impact on the average investor-owned electric utility. The impact of UOPP-HC is so great that it would have a significant impact on even the strongest electric utility.

In sum, it is probably not possible to say that the impact of UOPP-HC depreciation on the average investor-owned electric utility would be some specific percentage of the impact of UOPP-HC depreciation on Consumers Power. But if it were, the percentage would certainly be less than 100 per cent. Yet
it is also certain that the percentage would be high. The evidence makes it seem likely that the percentage would be high enough to justify investors, creditors, managers, regulators, consumers and others having practically the same concern for the impact of UOPP-HC depreciation on the industry as on Consumers Power.

Summary

The implications of UOPP-HC depreciation for Consumers Power Company are awesome. Had Consumers used UOPP-HC depreciation instead of UOM-HC in 1977, the company's net income would have been 29 per cent lower than the net income it reported. Its dividend payout ratio would probably have been over 100 per cent, thus making it explicit that the company paid out some of its capital.

If future inflation rates average no more than the 6 per cent average annual compound rate of the 1967 through 1977 period, the company's net income will be still lower. Progressively larger portions of Consumers' cash dividends will, in effect, represent a return of capital, no matter what those dividends are called.

At more realistic estimates of future inflation rates, it will be still more of the same--coming in ever shorter periods of time. Under these circumstances, more and more of Consumers' internally generated funds would come from depreciation and less and less from retained earnings. Also,
using UOPP-HC depreciation instead of UOM-HC depreciation would, as time passes, lead to higher and higher effective federal income tax rates.

Finally, evidence suggests that the impact of UOPP-HC depreciation on the average investor-owned electric utility is much the same as the impact of UOPP-HC depreciation on Consumers Power Company. Thus, the implications of UOPP-HC depreciation for the industry are substantially the same as the implications of UOPP-HC depreciation for Consumers Power.
CHAPTER VI

THE ALTERNATIVES

The purpose of Chapter V was to examine some of the more significant implications of UOPP-HC depreciation for Consumers Power Company specifically and for the investor-owned electric utility industry generally. When UOPP-HC depreciation is used instead of UOM-HC depreciation, the investor-owned electric utility industry's net income falls substantially from the industry's reported net income. Dividend payout ratios are much higher than they previously appeared to be. Cash dividends paid out are, at least in part, returns of capital. And the portions of the dividends that are in effect returns of capital get larger as inflation persists and as the rate of inflation increases. Retained earnings do not provide the proportion of internally generated funds that they reportedly provide. Effective tax rates are higher than quoted in financial reports. And from all indications, those effective tax rates will get still higher.

Hypothesis Confirmed

The substitution of UOPP-HC depreciation for UOM-HC depreciation goes a long way toward validating the evidence cited in Chapter I of the problems of the investor-owned electric utility industry. For example, with the implications
of UOPP-HC depreciation as discussed in Chapter V in mind, a review of the decline in the PE ratios of investor-owned electric utility common stocks shown in Figure 1 may help illustrate this point.

For the period from 1967 through 1977, Table VII in Chapter IV shows that UOPP-HC depreciation deviated from UOM-HC depreciation ever more widely from one year to the next. When this UOPP-HC depreciation is used instead of UOM-HC depreciation, as in Table XVI in Chapter V, UOPP-HC net income goes down steadily from the reported UOM-HC net income. The PE ratios shown in Figure 1 are based on reported UOM-HC net income. It follows that (1) if the UOPP-HC net income is the more valid net income, (2) if the more valid net income has been steadily declining, and (3) if investors look through the surface to the substance of the investor-owned electric utility industry's financial reports, the decline in PE ratios shown in Figure 1 is, if not warranted, at least "explained."

If the PE ratios were based on more accurate net income data, it seems likely that the decline would not be nearly as steep as shown in Figure 1. In fact, if all factors that would contribute to more accurate income figures were taken into account, and not just UOPP-HC depreciation, it might turn out that there is no decline in PE ratios based on accurate earnings. To pay $15 for a share of stock of a company that accurately reports earnings of $1 per share is
to pay fifteen times earnings. But, if 50 per cent of reported earnings are phony, to pay $7.50 for a share of stock of a company that reports earnings of $1 per share is to pay 7.5 times reported earnings but also to pay fifteen times genuine earnings.

The findings regarding UOPP-HC depreciation compared to UOM-HC depreciation, and net income that incorporates UOPP-HC depreciation compared to net income based on UOM-HC depreciation, also go a long way toward explaining Figure 2 in Chapter I. Figure 2 compares the price-earnings ratios of Moody's average of 125 industrial common stocks (1960 through 1974) and Standard and Poor's average of 500 predominantly industrial common stocks (1975 and 1976) with the price-earnings ratios of Moody's average of twenty-four utility common stocks (1960 through 1976).

There are two features of utilities, compared to industrials, that are particularly germane at this point: (1) utilities are more capital intensive, as explained in some detail in Chapter II and (2) utilities' assets have longer average lives. From the first feature it follows that depreciation is a larger portion of utilities' operating costs than of industrials' operating costs. From the second feature it follows that utilities have longer capital recovery periods, longer waits until assets are replaced at higher prices. With depreciation being a larger portion of operating costs and with that depreciation being claimed only after a greater
lapse of time during which there has been a greater change in the level of prices in recent times, understating depreciation affects utilities more seriously than it affects industrials.

If it is true that using UOM-HC depreciation during periods of inflation causes underdepreciation, as the evidence indicates, and if underdepreciation affects utilities more seriously than industrials, as the two features of utilities just cited suggest it does, the utilities' price-earnings ratios should have deteriorated more seriously since the mid-1960's than the price-earnings ratios of industrial firms. Figure 2 in Chapter II shows that this is precisely what has happened.

During the three-year period 1963 through 1965, utilities sold for about twenty times earnings while industrials sold for about eighteen times earnings. But over the period 1973 through 1975, while industrials sold for about eleven times earnings, utilities sold for about 7.5 times earnings. In 1975 and 1976, the last two years covered in this study, the PE ratio of the Dow Jones average of thirty industrials was 11.3 and 10.4. The PE ratio of Moody's twenty-four electric utilities for the same two years was 6.6 and 7.4.

So empirical evidence seems to fit the basic hypothesis of this study. The evidence in Chapter I seems to confirm the hypothesis that underdepreciation is a major contributing cause of some of the financial problems that private electric
utilities have faced in recent years. What are the alternative ways of solving the utilities' underdepreciation-related problems?

Stopping Inflation

The root cause of the utilities' depreciation-related problems examined in this study is inflation. Inflation causes the general level of prices to rise. Inflation causes the purchasing power of the dollar, the dollar's command over goods and services in general, to fall.

Simultaneously, during the period covered by this study, many time-tested practices and many time-tested norms persisted unchanged. In particular, the practice of basing tax-deductible depreciation on UOM-HC continued. Historic dividend payout ratios were maintained. And, broadly speaking, the returns on investment and returns on equity that state utility regulators permitted remained largely unchanged.

To argue then, under these circumstances, that one must somehow reckon with the changes that inflation brings, to argue that one must somehow accommodate the decline in the purchasing power of the dollar, is a red herring. To change accounting practices and tax laws, to lower dividend payout ratios, to permit utilities higher returns on their investments are all literally accommodative measures. Such measures are not curative.

The only real solution to the depreciation-related problems on which this study focuses is to stop inflation.
However, stopping inflation is not a realistic near-term prospect, for the reasons cited in Chapter V why a 12 per cent average annual inflation rate in coming years is even more likely than a 6 per cent rate.

When this major change, inflation, permeates an industry in which many practices and norms have not changed, something has to give. Something has to accommodate the change. For the regulated, investor-owned electric utility industry, that "something," as much of the evidence in Chapter I shows, has been primarily the market for utilities' outstanding securities. Utility creditors and stockholders, especially to the extent they have provided the utilities' permanent financing requirements, have absorbed the bulk of the changes brought by inflation. Specifically, utility creditors and stockholders have absorbed these changes via capital losses on the utility securities they hold. To date, in the inflationary setting, utilities have gotten along by an involuntary transfer of wealth—from creditors and stockholders to electricity consumers. However, if consumers are to get electricity when they want it, where they want it, and in the quantities they want it, investor-owned electric utilities must under present circumstances raise funds on an ever-increasing scale to replace their used-up plant. But to expect repeatedly to attract funds from the very groups whose wealth is also under present circumstances being transferred to electricity consumers is not realistic. Lenders and
investors will voluntarily supply funds to the private electric utility industry only if this wealth transfer stops, only if they are once again fairly compensated for their loans and investments.

In addition to helping clarify what groups the industry ought not count on to stop its financial hemorrhaging, this analysis of what has to date accommodated the changes wrought by inflation also helps clarify what is needed. If the private electric utilities are to stave off a financial crisis, they must have sufficient cash flows to stem the capital losses that creditors and stockholders have suffered. Having reached, and in some cases breached, the loss-tolerance threshold of creditors and stockholders, the investor-owned electric utilities are forced to look elsewhere for an inflation-accommodator. And that, as just explained, is tantamount to saying that the private utilities are now forced to look elsewhere for sources of larger cash flows.

Permitting Higher After-Tax Earnings

Regulation in general and rate making in particular were discussed in Chapter II. It is state regulators who determine what after-tax income they will permit the utilities subject to their regulation to earn on a given investment. By permitting higher after-tax earnings on a given investment, these regulators could increase the cash flows of the utilities they regulate.
Assuming that the private utilities are capably managed, sound finance dictates that these utilities be permitted after-tax earnings high enough to insure that net income performs at least two functions. These two functions are (1) to provide enough cash to pay reasonable dividends and (2) to provide retained earnings sufficient to maintain the equity buffer on which creditors based their decisions to make loans to these utilities. During periods of inflation, surely this second function includes providing enough cash to cover depreciation shortfall. These are the minimum requirements for maintaining the utilities' financial integrity.

For the industry actually to get the higher after-tax earnings that regulators could permit, the industry would have to cut some of its costs, raise the selling price of electricity, or both cut costs and raise selling prices. If the industry is operating efficiently at the outset, there will be little opportunity for increasing after-tax earnings by cutting operating costs.

However, the regulators' permitting higher net income might very well have a salutary impact on financing costs. Higher after-tax earnings would improve, among others, the industry's times-interest-earned and fixed-charge-coverage ratios. This would probably lead to lower interest rates and, in turn, to lower interest expense on at least all new debt. But since higher income taxes would partially offset lower interest expense, the industry could get at best only
part of the higher after-tax earnings that would mollify creditors and investors from lower interest expense.

Given the political nature of the regulatory process, regulators are naturally reluctant to permit higher after-tax earnings to the extent doing so leads to higher selling prices of electricity for consumers. But when stockholders clearly indicate that they are unwilling any longer to be the inflation-accommodator for the electric utility industry, as they did in the Utah Power and Light case cited in Chapter I, charging consumers higher prices for electricity becomes the line of relatively less resistance.

To propose higher after-tax earnings as the sole inflation-accommodator, however, is to propose that net income perform a third, nontraditional function. That third function would be to "cover" for depreciation, to make up for the deficiencies in UOM-HC depreciation during periods of inflation. This raises the obvious question, why should net income be expected to perform its normal role and some of the role of depreciation too? Why deal with underdepreciation in a less direct way when it is possible to cope with that underdepreciation in a more direct way? And, what potential problems are there in relying on net income to perform a function it does not normally perform?

For example, for each $1 in after-tax earnings destined to make up for a $1 deficiency in depreciation, it would require more than $1 in pretax earnings. To get that more
than $1 in pretax earnings, a utility would have to raise by more than $1 the prices it charges its customers. In this event, consumers would wind up in the curious situation of paying more than the full cost of the depreciable assets used up in the course of producing and distributing the electricity they consume. This illustrates how, if after-tax earnings were the sole inflation-accommodator, inflation would transfer wealth from users to politicians and bureaucrats.

Perhaps the greatest potential problem with using higher after-tax earnings to offset inadequate cash flows due to using UOM-HC depreciation during periods of inflation is this alternative's potential for being a meat cleaver approach to a job that requires a scalpel. The results reported in "The Results—in Detail" section of Chapter IV make it clear that discrepancies between UOPP-HC depreciation and UOM-HC depreciation are a function of more than the rate of inflation. When measured in dollars, those discrepancies are the deficiencies in cash flows which are the topic at hand. Thus, in addition to the rate of inflation, the deficiencies in a particular investor-owned electric utility's cash flow depend on whether the actions of management are (1) shortening or lengthening the utility's average asset life, (2) expanding or contracting the overall scale of operations, and (3) changing the rate of adopting new technology. Adjustments in after-tax earnings would appear to be a rather crude means
of responding accurately and timely to each of these factors for each regulated investor-owned electric utility.

Selling Assets

Investor-owned electric utilities can increase their cash flows in ways other than with higher after-tax earnings--and the higher rates those higher earnings imply.

Instead of seeking higher rates to improve its depleted cash flow, so Preston C. Shannon, a member of the Virginia State Corporation Commission, declared at a recent hearing, Virginia Electric Power Co. should hasten to sell a large part of its generating capacity to rural electric cooperatives. O. J. Peterson III, Vepco vice president and treasurer, protested that it was "almost cannibalistic" to dispose of assets to meet current operating expenses, rather like selling the furnace to pay the bill. Nevertheless, he and other Vepco executives disclosed that the company is negotiating just such a deal because it can find no other way out.

Commissioner Shannon went on to say that a trend toward such financing is afoot. Indeed it is. Georgia Power Co., a subsidiary of Southern Co., is a case in point. When it completes some deals now in the talking stage, it will have sold $3 billion worth of nuclear and coal plants to rural co-ops and municipal power companies; that's about 20 per cent of its generating capacity. Similarly, Gulf States Utilities Co. is just about ready to conclude an agreement to sell 40 per cent of a $1.3 billion nuclear power plant to two co-ops. Duke Power Co. has sold 75 per cent of one unit of its Catawba nuclear plant to municipalities. Now it is negotiating to sell the rest of the unit to them and the other unit of Catawba to co-ops.

Traditionally co-ops and municipalities have bought power wholesale and distributed it to retail customers. But they are now moving into power generation in a big way. Their stake in generating capacity already runs into billions of dollars and is expected to go much higher.

The utilities don't like the idea of selling out, but their strained finances give them scant choice.¹

¹Barrons, August 27, 1979, p. 4.
That portion of the electric utility industry that is not in the private sector (See Figure 10 in Chapter II) escapes some of the problems that plague the investor-owned portion of the electric utility industry. Those are the problems cited in Chapter I, problems such as having to sell stock below book value, being obliged to pay high market rates of interest on debt, and suffering numerous bond downgradings.

Rural cooperatives have access to liberal financing from the Rural Electric Administration, which to date has made over $14 billion of loans and loan guarantees for power plants. The bulk represents REA guarantees of loans by the Federal Financing Bank, which offers more favorable rates than those available to investor-owned utilities. REA's own loan rate is 5 per cent (except in hardship cases, where it is 2 per cent). Moreover the Banks for Cooperatives and the National Rural Utilities Cooperative Finance Corp. have extended around $900 million in easy credit. Both the co-ops and municipalities are exempt from federal taxes, and the latter have the advantage of being able to offer tax-exempt bonds.²

These final quotations may give some insight into the future of this segment of the electric utility industry.

Co-ops usually arrange to finance their nuclear purchases under REA's loan guarantee program. That program is a far cry from what Congress had in mind when it created the agency back in 1933. In those days, the idea was that REA would make 2 per cent loans to rural cooperatives, which would distribute electricity to farms too remote to be economically serviced by investor-owned utilities. Years ago, when 99 per cent of the nation's farms had been electrified, arguments were voiced that since REA had achieved its purpose, it should be terminated. But the agency had built a strong constituency in the co-ops, and the 2 per cent loans

²Ibid., p. 4.
had proved so attractive that co-ops began to expand into power transmission and generation. . . .

Presiding over REA's ambitious acquisition program is REA administrator Robert W. Feragen. In office since last October, he says he is eager to devote more time and talent to power financing. He has a long history of promoting public power; last year the American Public Power Association gave him an award for his achievements.3

In a fundamental sense, selling assets to increase deficient cash flows—deficient because of the inadequate depreciation on which this study focuses—is no solution at all. Selling assets just shifts the basic problem. In the specific cases cited, selling assets shifts the cash flow problem from the private sector to the public sector. The problems attending underdepreciation will persist. They will simply become the problems of the new owners of those assets. And unfortunately, these particular owners may have less incentive and be under less pressure than the managers, creditors, and stockholders of private electric utilities accurately to diagnose their cash flow problems and seek to solve them.

Allowing More Realistic Tax-Deductible Depreciation

Continuing to employ accounting practices that postulate a stable dollar when the purchasing power of the dollar is not stable appears to be at the heart of the investor-owned electric utilities' cash flow problems. As explained in

3 Ibid., p. 5.
Chapter II, electric utilities have been forced in some ways to acknowledge that the stable dollar postulate is not valid, that the purchasing power of the dollar has been declining significantly in recent years. For example, these utilities have paid higher wages and salaries for a given amount of labor, higher prices for fuel, and higher interest rates on a given dollar amount of new debt. But to date these same utilities have not paid more for their fixed assets in place. It is the failure fully to pay for the fixed assets being used up that results in inadequate cash flows, which inadequacies become very apparent when the investor-owned electric utilities seek to purchase and finance the replacement assets they need to maintain the service they provide their customers.

Allowing more realistic tax-deductible depreciation would correct this problem. Chapter III examines several forms of depreciation that would be more realistic than the UOM-HC depreciation that is presently so widely used. Chapter III also explains why UOPP-HC is considered the best of the more realistic depreciation alternatives.

Because of the decline in the purchasing power of the dollar, the cash flows of investor-owned electric utilities may be inadequate at other points not covered in this study. For example, to over-simplify, suppose at a time when there was little or no inflation, a utility could float bonds with a 5 per cent coupon. At that same time regulators permitted,
say, a 10 per cent return on stockholders' equity. Then, suppose that because of a 6 per cent annual inflation rate for several years that utility had to pay 11 per cent on new debt. It would then seem that this utility should be permitted after-tax earnings high enough to give new stockholders about 16 per cent on their investment, if parity is to be maintained between creditors and stockholders. In this case, allowing the private utilities higher after-tax earnings would probably be the best single means of stopping the utilities' financial hemorrhaging at this particular point. But this study is limited to stopping the utilities' hemorrhaging at just one point, viz., depreciation.

Conclusion

The investor-owned electric utilities are being forced to rely, on an ever-increasing scale, on external sources of funds to replace their used-up plants—as detailed in Chapter I. At the same time, the industry's present return on equity will not for long supply the retained earnings and cash dividends to support such additional external financing.

UOM-HC depreciation has "papered over," has disguised for a time, the involuntary wealth transfers worked by inflation. But creditors and stockholders, the two groups who have suffered most in the wealth transfers, are balking—and rightly so.

To avoid the financial crisis toward which the private electric utilities are now headed, they must promptly seek,
find, and adopt an alternative to these wealth transfers. The utilities' problem reduces to a problem of inadequate cash flows. Thus, alternatives to the wealth transfers must be alternative ways of shoring up the industry's cash flows.

The four alternatives considered in Chapter VI are (1) stopping inflation, (2) permitting higher after-tax earnings, (3) selling assets, and (4) allowing more realistic tax-deductible depreciation.

This study suggests that one particular form of more realistic tax-deductible depreciation, viz., UOPP-HC depreciation, would be the best single device for rectifying the investor-owned electric utilities' problems due to underdepreciation. The case for adopting UOPP-HC depreciation over other more realistic forms of tax-deductible depreciation is made in Chapter III. But the following reasons for adopting UOPP-HC depreciation explain the case for adopting this particular form of depreciation—over other forms of depreciation, as well as over other alternatives for shoring up the private utilities' inadequate cash flows—still more fully.

(1) If continued inflation is considered as a given, UOPP-HC depreciation would stop the problem of inadequate cash flows due to underdepreciation right at the source of the problem.

(2) Once permitted by tax laws and by regulators, UOPP-HC depreciation would adjust current depreciable fixed asset
costs automatically to changing inflation rates. Any lag would be limited to the lag in the publication of the GNP implicit price deflator.

(3) UOPP-HC depreciation rests on the familiar and time-tested historical cost principle.

(4) Because of the considerable controversy over the construction of price indices, it may be too much to claim that UOPP-HC depreciation, which employs the GNP implicit price deflator, preserves the objectivity principle. Suffice it to say, however, that whatever the defects of this particular index, it does have this significant virtue. The construction of the GNP implicit price deflator is independent of the managers, public accounting firms, state regulatory commissions, the Internal Revenue Service, and all others who have a vested interest in the investor-owned electric utilities.

(5) A signal virtue of UOPP-HC depreciation is that it accurately tracks each individual utility's particular depreciable asset situation.

(6) UOPP-HC depreciation would help restore, during periods of inflation, the parity that existed among the private utilities' various constituencies—especially creditors, stockholders, and customers—during periods of insignificant or no inflation. If during noninflationary periods the relationships among those constituencies were considered sound
and viable, surely a technique that would help restore those relationships is desirable.

(7) It might be argued that UOPP-HC depreciation does not indicate to whom the difference between UOPP-HC depreciation and UOM-HC depreciation belongs. This is true. But UOPP-HC depreciation does not purport to deal with this important issue. This more realistic form of depreciation only insures that, at the time it is computed, the cost, as defined in the first section of Chapter III, of depreciable assets used up is recovered.

The disposition of the difference between UOPP-HC depreciation and UOM-HC depreciation is another and separate issue from the central issue of this study. The purpose of the appendix to this chapter is briefly to comment on the disposition of the difference between UOPP-HC depreciation and UOM-HC depreciation.

This study certainly does not claim that UOPP-HC depreciation is a panacea for the investor-owned electric utilities' problems. UOPP-HC depreciation would do nothing to reduce the power of OPEC. It would do nothing to allay the fear that some people have of nuclear power. It would do nothing to alter people's concern about the environment. Nor would it operate to hold down electric rates. The good and the bad in regulation in the past would continue to be the good and bad in regulation.
U OPP-HC depreciation simply recognizes that the traditional postulate of a stable measuring unit is not valid. U OPP-HC depreciation explicitly recognizes inflation, the root evil. U OPP-HC depreciation would help secure the heart of the industry's business, the physical plant and equipment that generate and transmit electricity to electricity consumers. U OPP-HC depreciation, in sum, is a method of recognizing one of the real costs that has to be met in the long run if privately-owned utility service is to survive. It is a check and preventative to capital consumption caused by inflation.
CHAPTER VII

A SUBSEQUENT VIEW—1977-1980

The emphasis of this study is on the period 1964 through 1976. However, to appreciate the study more fully, it may be useful to look at a few of the highlights of what has been happening to the investor-owned electric utility industry and at a few of the highlights of what has been happening in the field of financial accounting since 1976.

The hypothesis underlying this study is that under-depreciation is the cause of some of the serious problems that investor-owned electric utilities have encountered in recent years. And depreciation adjusted for changes in the general level of prices would do much to solve these problems. The cause of the underdepreciation, in turn, is inflation.

Since 1976, inflation has become even more severe than it was during the period covered by the study. In 1976, the GNP implicit price deflator was 134. The GNP implicit deflator for personal consumption expenditures was 140 in 1977. It rose to 150 in 1978. It rose still further to 163 in 1979. And as of March, 1980, this measure of inflation stood at 176. In sum, between the end of the last year covered by this study and March, 1980, there was 31 per cent inflation. It is not surprising, then, that the evidence of problems due
to underdepreciation persists. Consider several specific indicators of the problems.

In 1976, the market price to earnings (PE) ratio of Moody's twenty-four electric utilities was 7.4. This ratio rose a little in 1977, to 7.8. It then fell back to 7.4 in 1978 and fell still further to 6.6 in 1979. The average market price of the common stock of these utilities for the period January, 1980 through October, 1980 was 6.5 times their earnings for the twelve months ending June 30, 1980.¹

In 1976, the market price to book value ratio (book value excluding deferred taxes) of Moody's twenty-four electric utilities was 78 per cent. In 1977, the average market price was 86 per cent of book value. Then in 1978 and 1979 this ratio slumped to 79 per cent and 71 per cent, respectively. And during the period from January of 1980 through October of 1980, the average market price of these utilities' common stock was 65 per cent of the estimated book value for this period.

The average dividend payout ratio of the investor-owned electric utilities that make up Moody's electric utilities average was 64.4 per cent in 1976. That payout ratio increased to 65.7 per cent in 1977, to 69.6 per cent in 1978, and stood at 69.5 per cent in 1979. Of course this was tantamount to retention ratios of 35.6 per cent, 34.3 per cent, 30.4 per

cent, and 30.5 per cent in 1976, 1977, 1978, and 1979, respectively. Based on actual dividend rates and reported earnings rates over the period from January of 1980 through October of 1980, it appears that these utilities will have a dividend payout ratio close to 75 per cent and a retention ratio of only about 25 per cent for all of 1980.

So at the same time equity investors continued to accord the common shares of investor-owned electric utilities historically low PE multiples and market values substantially less than book values, these electric utilities used successively smaller percentages of their reported net incomes to provide internal financing.

Consider another equity-related indicator of problems in the electric utility industry, viz., return on equity (ROE). In 1976, the ROE of Moody's twenty-four electric utilities was 10.6 per cent. That ratio increased to 11.0 per cent in 1977, slipped to 10.7 per cent in 1978, and rose slightly to 10.8 per cent in 1979. Based on actual data through October of 1980, it appears that the ROE for Moody's electric utilities for all of 1980 will drop to about 10.2 per cent. Keep in mind that these were the returns on equity at the same time the annual rate of inflation rose and the per share book value of stockholders' equity was diluted as new common stock was sold for less than book value!

One of the most dramatic changes in the plight of investor-owned electric utilities since 1976 is the increase
in their cost of new debt. In 1976, the yield on the bonds of the public utilities in Moody's public utility average was 9.17 per cent. The corresponding figure for March, 1980 was 14.33 per cent. This March, 1980 yield is about 56 per cent greater than the 1976 yield.

But of all the evidence that problems due to under-depreciation persist in the investor-owned electric utility industry, a comparison of the returns on equity investments with the yields on bonds may be the most instructive. This comparison shows that it is especially equity investors who have been "taking it on the chin." And this lends credence to the hypothesis that underdepreciation is a major cause of the investor-owned electric utilities' current problems.

In their article "Who Says Utilities Are Less Risky?", J. Gordon Christy and George A. Christy discuss six kinds of risk in stock or bond investments. Of the six different risks, the authors contend

The most serious and pervasive risk today is the price level risk. For each individual or business that fails, a thousand feel the losses of price inflation. Unless profit rates, dividend payments, capital consumption allowances, and retained earnings rise fast enough to offset a shrinking dollar, a company's owners suffer a real loss whatever the dollar sum financial reports may say.

Of all businesses, utilities are by far the most exposed to the price level risk. This exposure arises primarily out of their capital intensity and regulated status. It centers chiefly in their great vulnerability to underdepreciation, which impairs the quality of their earnings, and to the undercosting (by regulators) of their common equity, which impairs the quantity of their earnings. . . .
It seems paradoxical that bond yields have more than doubled since 1965, and embedded interest costs have nearly doubled, while returns on common equity have actually fallen for electric utilities [emphasis added] and risen only insignificantly for other utility groups. Obviously, the price level risk for utility common stock is very high.²

The authors then proceed to explain why the price level risk for utility common stock is so high. This explanation lends further support to the thesis of this study that emphasizes the period 1964 through 1976.

Why should the price level risk seriously afflict the size of returns to the common equity of utilities when an "adjustment for inflation" is freely accorded to their bond buyers? There appear to be two main reasons. First, unlike bond yields and other interest rates, the cost of common equity is not a determinate figure, visibly set and regularly quoted in the securities markets. It must be judged, inferred, or deduced from market or numerical data, by various calculations or mathematical models, all of which are debatable and subject to interpretation. Second, so long as utilities remain solvent, they are in fact usually able to raise new common equity—simply by selling stock at a sufficiently low price to attract investors. The fact that utilities remain able to attract new equity capital, even at rates of return scarcely above bond yields, may operate to dispel any sense of urgency on regulators' part about raising rates of return to equity shareholders.

For utilities, the price level risk is insidious because its consequences are covert and long delayed. Much of the reason lies in the fact that at least two important costs of capital are in large degree postponable. This is true of adequate depreciation, and it is true of a fair return on common equity.³

Based on the highlights and views of what has happened to investor-owned electric utilities since 1976, it appears on


³Ibid.
balance that the position of the utilities has continued to
deteriorate since the end of the period emphasized in the
body of this study. Certainly both market data and economic
analysis suggest that conclusion.

However, since 1976 the stream of concern with the impact
of inflation on depreciation charges and asset replacement
costs has broadened. It has reached far beyond the domain of
utilities, and even of capital intensive industries generally
to encompass investor-owned companies as a whole. Consider
the following highlights of developments in financial account-
ing, especially in accounting for inflation, since 1976 began.

Regulation S-X is the Securities and Exchange Commission
(SEC) regulation that prescribes the form and content of
financial statements filed with the SEC. This regulation

. . . was amended on March 26, 1976 by Accounting
Series Release (ASR) No. 190 to add a new rule, Rule
3-17. Rule 3-17 applies only to registrants whose
inventories and gross property, plant and equipment
total more than $100 million and when that sum
exceeds ten per cent of total assets.4

Rule 3-17 became effective for financial statements ending
on or after December 25, 1976. Essentially this rule
requires larger firms registered with the SEC to include
replacement cost data on their inventories and depreciable
assets in their financial statements. It is primarily
because of inflation, of course, that replacement cost data

4Richard C. Adkerson, "Replacement Cost Accounting: A
Time to Move Forward," Management Accounting, LIX (December,
1977), 15.
in recent years have diverged widely from historical cost data. Specifically, the rule requires at least general comments on the amount of replacement costs and on the impact of replacement costs on the firm in the firms' annual reports. This rule requires more detailed data and more specific comments in the firms' Forms 10-K.

What have the results of ASR 190 been? For one thing, ASR 190 has aroused a number of objections. "The objections could be classified generally into four groups: (1) the cost of implementation, (2) the incomplete nature of the rule, (3) the imprecise and subjective nature of the data, and (4) the absence of guidelines for compliance."5

Of these objections, the most persistent appears to be the objection to the "imprecise and subjective nature of the (replacement cost) data." This reaction from Edward J. Bailey, vice president and assistant controller of International Telephone and Telegraph Corporation is representative: "Whatever method is ultimately decided upon must be free of the impreciseness and subjectivity of ASR 190."6

Here is another example of specific objections to ASR 190. Robert W. Berliner, a partner of Arthur Young and Company, observes:

5Ibid.

The SEC version of replacement cost accounting is silent on a conceptual framework—for instance, there is no expressed concept of capital maintenance or of income.

There is a further need to eliminate any confusion as to what the replacement cost information purports to disclose: the effects of declines in the value of money (inflation), or the effect of other economic factors, or both.

Another problem [cited in the body of this study on page 74] is the entire matter of how to handle the operating cost savings a company might realize were it to replace its existing productive capacity with capacity of advanced technology.7

The National Association of Accountants (NAA) commissioned a series of research projects directed toward learning about reaction to and compliance with ASR 190. The period covered was essentially 1977. This research found that

... a variety of procedures were followed in obtaining replacement costs, that many replacement costs are very subjective in nature, and that management views replacement costs as having little or no internal or external use. It also appears that replacement costs may not have been as costly or difficult to obtain as was expected, and that users of external reports are not being greatly influenced by ASR disclosures.8

Another highlight in financial accounting, especially in accounting for inflation, since 1976 is the Financial Accounting Standards Board's (FASB's) issuing Statement number 33.9 "Beginning in 1979, FASB Statement no. 33, Financial


Reporting and Changing Prices requires public companies meeting certain size tests to experiment with preparing and reporting information about the effects of changing prices on business enterprises.¹⁰

The statement's reporting requirements apply to public enterprises that have either (1) inventories and property, plant and equipment (before deducting accumulated depreciation) amounting to over $125 million or (2) total assets amounting to over $1 billion (after deducting accumulated depreciation).

The specified firms are required to provide information that is supplementary to the information provided in conventional financial statements. The supplementary information is information that recognizes changes in the general level of prices (constant dollar information) and changes in prices related to specific assets (current cost information). It is not comprehensive. It pertains only to inventories, fixed assets, costs of goods sold, and depreciation, depletion, and amortization expense. The statement also requires a discussion of the significance of the supplementary constant dollar and current cost information to the firm providing the information.

FASB Number 33 is explicitly experimental. It gives little specific guidance on how to generate the constant dollar information.

dollar and current cost information that it requires. Although the FASB encourages experimentation in developing the information Statement Number 33 requires and although the required information is supplementary information, the FASB wants the information to be credible. For that reason the FASB has requested auditor involvement in the information.

In response to this request, the auditing standards board of the American Institute of CPAs recently issued Statement on Auditing Standards no. 27, Supplementary Information Required by the Financial Accounting Standards Board,\(^{11}\) and proposed another statement, Supplementary Information on the Effects of Changing Prices.\(^{12}\)

Although neither SAS no. 27 nor the proposed SAS requires supplementary information on changing prices to be audited, both call for auditors to apply certain procedures to the information and to report any exceptions.\(^{13}\)

Despite the FASB's deliberate effort to ensure that the information provided in response to FASB Number 33 is credible, this statement, like ASR 190, has elicited varied reactions. Harold M. Williams, chairman of the SEC, commenting on reactions to the exposure draft that culminated in Statement Number 33, said,

\(^{11}\)Statement on Auditing Standards no. 27, Supplementary Information Required by the Financial Accounting Standards Board, New York, AICPA, December, 1979.


The FASB's recent exposure draft on "Financial Reporting and Changing Prices" offers significant potential for meaningful progress. I, therefore, am most disappointed with the tenor of many of the responses to the FASB proposal. They are primarily negative and self-serving—the same criticisms I have heard for years. They also seem calculated to ensure that the status quo will be maintained and that the problem will remain unsolved. While it is not certain that all the data to be provided will be useful—and it can be confusing—the FASB action is an essential step if progress is to be made in dealing with the effects of inflation and changing prices on the relevancy of financial information.14

More recently and more specifically, in its 1979 annual report American Telephone and Telegraph said this about the information FASB Statement Number 33 required the company to disclose:

The disclosure . . . is misleading. . . . The company's dividend policies comply with legal requirements applicable to all businesses and are based on many considerations including the desire of its share owners to receive a cash return on their investment.15

Furthermore,

The company's assistant comptroller, W. Warren Brown, expands: "FASB 33 is based on the faulty premise that depreciation is a charge against current income for the replacement of plants. Depreciation is simply the amortization of the historic cost of the plant."

AT & T's Brown argues that current-cost accounting not only misstates the effects of inflation but actually creates inflation! Listen to this: "There's a general obligation to pay dividends because of the way American business has grown up. A company can't just cut out its dividends," says Brown. "There's a social obligation there to the investors. So, the only alternative


for a company that wants to eliminate this supposed drain is to increase its prices. That creates more inflation and starts the cycle over again. I don't think the FASB should be setting policies like that."16

In their article, "Inflation Accounting for Utilities," James R. Holmes and Myrtle W. Clark examine the impact of FASB Statement Number 33 on utilities specifically. Their particular concern is which of the two corrective methods prescribed by FASB Statement Number 33—constant dollar accounting (for years ending on or after December 24, 1979) and current cost accounting (beginning in 1980)—is the more appropriate for utilities. They conclude:

Consideration of the objectives of the two methods and the impact of each on subsequent financial decisions leads us to conclude that constant dollar accounting is more appropriate for utilities than is current cost accounting.17

One major reason for coming to this conclusion is that under constant dollar reporting, existing customers are asked to recover the cost, in terms of purchasing power, of existing facilities. Costs of replacement facilities will be paid for by customers who use those new facilities. In contrast, under current cost accounting, existing customers must recover not only the cost of existing facilities but must also provide for any increased cost of future facilities which they may well never use. Obviously, the current cost method would have the wrong customers pay for future facilities.18

This conclusion and reasoning nicely corroborate some of the conclusions and recommendations of this study.

16Ibid.

17James R. Holmes and Myrtle W. Clark, "Inflation Accounting for Utilities," Public Utilities Fortnightly, CVI (July 17, 1980), 17.

18Ibid.
So although ASR 190 and FASB Statement Number 33 are halting, somewhat feeble, and certainly controversial steps, they are steps aimed at improving accounting for inflation. Since they are incomplete and imperfect steps, it is not surprising that they have met with many objections and much criticism. But just as it would be unreasonable to expect a baby's first steps to be perfect, it is probably equally unreasonable to expect ASR 190 and FASB Statement Number 33 to be the perfect solution to accounting for inflation. It is simply necessary to take the first and second steps before it is possible to see where the third step should be.

There is considerable evidence that some of the work of both the SEC and the FASB since 1976 (such as ASR 190 and FASB Statement Number 33) has raised managers', creditors', investors', regulators', and politicians' level of accounting-for-inflation awareness. This heightened awareness promotes new perceptions. The following quotation is a very current example of the new perceptions caused by FASB Statement Number 33.

Many companies disclosed in their 1979 annual reports that they are, in fact, shrinking. They are paying dividends with dollars they never earned and don't really have. What's more, they are paying these dividends after paying taxes with effective rates that are shockingly high--commonly ranging up to 75%. . . . The dividend payout seems particularly traumatic for companies with heavy capital investments in older plants and inventories. . . . Ford Motor, for example, with numerous aged plants showed historical-cost earnings of $9.75 a share in 1979 but current-cost income of $1.78. At the same time, Ford paid dividends of $3.90. That was a payout of $2.12 a share the company didn't really have--about $225 million. . . .
These are hardly isolated examples. Everyone knows that virtually all utilities have been playing this game for years. According to Sidney Davidson, professor at the University of Chicago Business School who has researched and written widely about inflation accounting, it is likely that over a fourth of all major firms are paying dividends larger than their inflation-adjusted earnings. That's corporate shrinkage on a titanic level. "We've got a time bomb here," says Davidson. "As people fasten on to these data and come to recognize what they mean, management's going to have an awful lot more thinking and explaining to do."

Is corporate America stupid? Not really. But it takes time to change habits of a lifetime. Davidson: "They've all grown up in a world of generally accepted accounting principles . . . where you focus on the formal historical-accounting data and not the current meaningful data. Of the boards on which I serve [which include Zenith and Brunswick], not one of them has ever considered this inflation question in deciding dividend costs." Gives you the picture of huge companies deciding dividends with a Ouija board, doesn't it? . . .

. . . it may be that any number of firms, particularly those in capital-intensive industries, are in a crisis situation right now. They just don't know it. What's more, eating into capital to pay dividends isn't a new trend. "This kind of thing has been going on since the high inflation rates of the mid-Seventies started, at least," says William Joyner, a partner with Price Waterhouse and Co. "In effect, these companies are liquidating themselves. If you pay out more than you take in, eventually there won't be anything left."

. . . "If people don't stop eroding physical capital," says Mike Tearney, a manager with Peat, Marwick, and Mitchell and Co., "all American business is going to have trouble. Maybe not next year or in five years. But it has to happen." You can't argue with that logic.

It is such new perceptions which are potentially very useful in helping managers, creditors, investors, and others see what the next steps in accounting for inflation should be. This is progress.

All-in-all, the plight of investor-owned electric utilities appears to be as critical now as at any time during the period covered by this study—probably even more critical since inflation has accelerated in the interim. It also appears, perhaps even more clearly, that underdepreciation is indeed a major factor in explaining the utilities' plight. Since 1976, some specific steps have been taken to account for inflation. At least, these steps have stimulated considerable thought and discussion on alternative ways of coping with the underdepreciation. Some of this thought and discussion tends to corroborate this study's recommendation, viz., to cope with underdepreciation by adjusting historical-cost depreciation for changes in the general level of prices. None of the thought and discussion encountered in the research for the chapter tends to refute this study's recommendation.
APPENDIX

The purpose of this Appendix is briefly to comment on the disposition of the difference between UOPP-HC depreciation and the UOM-HC depreciation.

At first blush, it might seem appropriate to allocate the difference between UOPP-HC depreciation and UOM-HC depreciation to bondholders, preferred stockholders and common stockholders in the proportions that they finance a firm's depreciable assets. But on close examination, such an allocation seems untenable.

One method of allocating part of the difference between UOPP-HC depreciation and UOM-HC depreciation is illustrated in George Christy's 1977 testimony before the Illinois Commerce Commission in behalf of the Peoria Water Company. (Case number 77-932-1.)

Christy and other proponents of this method contend that the concept of depreciation shortfall is applicable to the extent that a firm's capital is financed with common stock. But they contend that the concept is not applicable to the extent the firm's capital is financed with bonds and preferred stock.
Why the Concept is Not Applicable to Bond and Preferred Stock Financing

When a firm issues bonds, the firm commits itself to paying out fixed amounts of dollars. The semiannual interest payments and the principal payments are all payments of a fixed number of dollars specified at the time the bonds are issued.

Assuming the firm operates profitably, the firm will recover fixed numbers of dollars (equal to the number of dollars paid for the depreciable assets) via UOM-HC depreciation. Thus, to the extent the depreciable assets are financed with bonds, the firm using UOM-HC depreciation will recover the exact number of dollars needed to repay the face amount of its bonds.

An anticipated-inflation risk premium may be one component of the interest rate paid on bonds. When this premium is in an interest rate, the fixed-dollar semiannual "interest" payments on the bonds are really in part repayments of principal. UOM-HC depreciation does not recover enough dollars to make this part of the principal repayments on a firm's bonds. It is left to "interest" expense to recover enough dollars to make this part of the principal repayments. And that expense is recoverable as part of a regulated utility's operating income.

In short, UOM-HC depreciation recovers enough dollars to make the principal payments in the face amount of bonds but
not enough to make the principal payments implicit in "interest" that includes an inflation risk premium too. However, no matter what functions are served by what is called interest, depreciation never provides the funds with which to pay interest.

This is not, however, an indictment of the UOM-HC method of determining depreciation. This is merely a statement of what UOM-HC depreciation does and does not do. The firm issuing bonds compensates bondholders for anticipated inflation through "interest" payments. The firm does not presume to raise the money for these payments from depreciation. The firm does promise to repay the bondholders at maturity with the number of dollars the bondholders loaned the firm. With dollar recoveries through UOM-HC depreciation, the firm is able to fulfill this promise.

In some ways, financing with preferred stock is the same as financing with bonds. In some ways financing with preferred stock is different.

Under normal circumstances, when a firm issues preferred stock, the firm commits itself to paying out a fixed number of dollars to its preferred stockholders in quarterly cash dividends. Since preferred stocks are usually issued in perpetuity, the issuing firm usually goes not commit itself to paying back the par value of this stock.

To the extent a firm's depreciable assets are financed with preferred stock, the profitable firm using UOM-HC
depreciation will recover the exact number of dollars needed to maintain the preferred stockholders' dollar investment in the firm.

As in the interest rates on bonds, there may be an anticipated-inflation risk premium in the dividend rate on preferred stocks. When this premium is in a preferred dividend rate, the fixed-dollar dividend is in part a return of capital. UOM-HC depreciation does not recover enough dollars to maintain the preferred stockholder's dollar investment in the firm and to pay this return of capital also.

Again, however, merely pointing out what UOM-HC depreciation does and does not do is not an indictment of this method of determining depreciation. The firm that issues preferred stock compensates the preferred stockholders through dividends for the inflation anticipated when the preferred stock is initially sold. The firm does not presume to raise the money for these dividends from depreciation. The firm does, in effect, promise to plow back into the firm indefinitely the number of dollars preferred stockholders invested. The firm that uses UOM-HC depreciation is able to do this.

At this point it may be useful to take a closer look at the inflation premium component that may be in the interest on bonds and the dividends on preferred stock.

Since the inflation premium is intended to compensate bondholders and preferred stockholders for decreases in the purchasing power of their dollar investments and since the
difference between UOPP-HC depreciation and UOM-HC depreciation is intended to measure the shortfall in depreciation due to a decrease in the purchasing power of the dollar, inflation premiums and the difference between UOPP-HC depreciation and UOM-HC depreciation are akin.

The interest paid on bonds is a tax-deductible expenditure to the firm that pays the interest. Thus, when there is a return-of-capital component in "interest" expense, that component, although mislabeled, is accorded the correct tax treatment from the paying corporation's point of view. That return-of-capital component, like depreciation, is excluded from the corporation's taxable income. From the "interest" recipient's point of view, the return-of-capital component of the "interest" does not get the proper tax treatment. To the recipient, all of the "interest," including the return-of-capital component, is taxed as if it were bona fide interest income.

The dividends paid on preferred stock are not a tax-deductible expenditure to the firm that pays them, however. Dividends on preferred stock are paid from after-tax dollars. Thus, the return-of-capital component of dividends paid on preferred stock is not accorded the correct tax treatment from either the recipient's point of view or the paying corporation's. The recipient would have to pay income tax on what is, in fact, not income but a return of capital. And the paying corporation is not permitted to treat the
return-of-capital component of preferred dividends as the
capital consumption expense that it is. Note, however, that
since the taxes on preferred earnings are treated as an
expense for rate-making purposes, the after-tax feature of
preferred dividend dollars does not affect a regulated
utility's net income.

In addition to the tax positions of the preferred
dividend recipient and the paying corporation, the selling
price to the consumer is also affected by the fact that
dividends on preferred stock are paid from after-tax dollars.
A firm with a 40 per cent marginal tax rate would have to
charge $1.67 in its prices to consumers to get a $1.00 to pay
a $1.00 inflation premium to its preferred stockholders. Thus,
the fact that dividends on preferred stock are paid from after-
tax dollars obviously does materially affect the prices
utility customers pay.

Therefore, the fact that UOM-HC depreciation does not
recover enough dollars to cover the return-of-capital com-
ponent of preferred stock dividends seems more significant
than the fact that UOM-HC depreciation does not recover
enough dollars to cover the return-of-capital component of
interest payments on bonds.

However, again it must be pointed out that the firm
using UOM-HC depreciation is able to meet with that method
of depreciation all of the obligations to bondholders and
preferred stockholders that it presumes to meet through
depreciation. And the firm simply does not presume to pay the return-of-capital components in interest on bonds and in dividends on preferred stock from dollars recovered through depreciation. So, in regard to preferred stock, the most pertinent fact is still this: With UOM-HC depreciation, a profitable firm can maintain indefinitely the dollar investment of the preferred stockholders. And as long as the firm maintains the rate of return on that dollar investment that attracted preferred stockholders, the firm can meet all of the preferred stockholders' claims.

One final point should be emphasized. The anticipated-inflation risk premiums in interest on bonds and dividends on preferred stock may not fully compensate bondholders and preferred stockholders for actual inflation. But bond-buyers and preferred stock-buyers who are concerned over inflation are free to reject interest or dividend rates which they feel may prove too low in the future.

A recapitulation of this discussion on financing with bonds and preferred stock may be useful at this point.

When a firm issues bonds and preferred stock, it incurs contractual obligations to those who purchase the bonds and preferred stock.

The firm can meet the first significant part of those obligations, viz., paying the face amount of the bonds to whoever holds them at maturity and maintaining indefinitely the dollar investment by the original buyers of the
preferred stock, with dollars recovered via UOM-HC depreciation. So although UOM-HC depreciation does not satisfy the criteria functions of depreciation established in "The Criteria" section of the conclusion of Chapter III, using UOM-HC depreciation does not impair a firm's ability to meet all of the contractual obligations to bondholders and preferred stockholders that it presumes to meet via depreciation.

The second significant part of a firm's contractual obligations to its bondholders and preferred stockholders is paying interest to the former and dividends to the latter. Since interest and dividends are not paid with revenue dollars recovered via depreciation, using UOM-HC depreciation does not impair a firm's ability to meet these contractual obligations either.

However, the return-of-capital component of interest comes from pretax dollars. The return-of-capital component of preferred dividends comes from after-tax dollars. This, of course, matters only to the rate payers who must pay the income taxes on preferred earnings. The taxes are allowed as an expense to utilities for rate-making. This makes it more costly for a firm to compensate preferred stockholders than bondholders for anticipated purchasing power losses. Admittedly, firms do not presume via UOM-HC depreciation to recover the dollars necessary to make all repayments of capital that bond buyers and preferred stock buyers expect. Still, UOM-HC depreciation's not recovering enough dollars to pay the return-of-capital component in preferred dividends
seems more significant than UOM-HC depreciation's not recovering enough dollars to pay the return-of-capital component in interest on bonds.

In short, a firm has only fixed-dollar obligations to those investors who buy the firm's bonds and preferred stock. UOM-HC depreciation is basically a fixed-dollar method of depreciation. So even during periods of inflation, using UOM-HC depreciation does not jeopardize the firm's ability to meet those obligations. Using UOM-HC depreciation enables the firm to do for the bondholders and preferred stockholders everything it presumes to do for these senior security holders via depreciation. Thus, the UOPP-HC depreciation concept and the issue of allocating the difference between UOPP-HC depreciation and UOM-HC depreciation are not applicable to a firm to the extent it finances with bonds and preferred stock.

Compensation for anticipated losses from inflation may be built into interest on bonds and dividends on preferred stock. If investors believe interest and preferred dividend rates will not enable firms to do for bond-buyers and preferred stock-buyers everything that it presumes to do for these senior security buyers via these rates, including providing inflation protection, would-be investors are free to reject those rates.

Why the Concept is Applicable to Common Stock Financing

The situation is quite different with common stock. In regard to the common stockholder,
His earnings are affected because of his residual—or final—position in the capital structure. Unless his earnings are preceded by an adequate allowance for the replacement of the assets he has contributed, these earnings are not genuine. Some of his reported profit will be consumed—taken back—when the assets he originally paid for have to be replaced on a higher price level. Retained earnings will be pre-empted, not to expand the plant, but merely to replace it. So in reckoning true earnings for the common-stock equity, or in calculating the true return on it, that portion of total depreciation shortfall which will be needed to replace assets implicitly bought with common equity must be subtracted from total reported profit to common (Source: Christy's testimony cited above).

To apply this method of disposing of part of the difference between UOPP-HC depreciation and UOM-HC depreciation, the first step is to compute total depreciation shortfall, as was done in this study. The next step is to determine what portion of the firm's total capital is provided by common stock equity. The total depreciation shortfall is then multiplied by that proportion. The resulting product is the portion of the total depreciation shortfall applicable to the common stock equity. It is only this portion of total depreciation shortfall applicable to common stock equity that is then subtracted from UOM-HC net income to arrive at the true earnings on common equity.

The Unallocated Difference Between UOPP-HC Depreciation and UOM-HC Depreciation

It might seem that allocating to bondholders and preferred stockholders the difference between the total depreciation shortfall and the portion applicable to common stock would be equivalent to paying an inflation premium in interest
and preferred dividends equal to the actual rate of inflation. A simple numerical example will demonstrate that this is not the case.

Assume that a $1,000 bond is sold at par with an 11 per cent coupon. Of the 11 per cent, 7 per cent is the inflation premium. The $1,000 proceeds from the sale of this bond are invested in an asset that is fully depreciated over its five-year life on a straight-line basis. Further assume that over the asset's life the actual simple annual inflation rate is 7 per cent. These assumptions underlie the data shown in Table XX.

### Table XX

**Difference between UOPP-HC Depreciation and UOM-HC Depreciation Compared to 7 Per Cent Inflation Premiums (Actual Inflation Rate: 7 Per Cent)**

<table>
<thead>
<tr>
<th>End of Year</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>(1) UOPP-HC Depreciation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>214</td>
<td>228</td>
<td>242</td>
<td>256</td>
<td>270</td>
</tr>
<tr>
<td><strong>UOM-HC Depreciation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>200</td>
<td>200</td>
<td>200</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td><strong>Difference</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>28</td>
<td>42</td>
<td>56</td>
<td>70</td>
</tr>
<tr>
<td><strong>(2) 7 Per Cent Inflation Premiums</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>70</td>
<td>70</td>
<td>70</td>
<td>70</td>
<td>70</td>
</tr>
</tbody>
</table>

The data contrast how the bondholder would fare if he received the difference between UOPP-HC depreciation and
UOM-HC depreciation in lieu of a 7 per cent inflation premium in interest. Allocating the entire difference between UOPP-HC depreciation and UOM-HC depreciation to the bondholder would give him less, but less by a narrowing margin, in Years 1, 2, 3, and 4 than he would receive via an inflation premium equal to the actual rate of inflation. In Year 5, the difference between UOPP-HC depreciation and UOM-HC depreciation is exactly equal to the inflation premium.

The reason allocating the difference between UOPP-HC depreciation and UOM-HC depreciation to the bondholder is not equivalent to paying him accurately-forecasted inflation premiums is this:

In allocating the difference between UOPP-HC depreciation and UOM-HC depreciation to the bondholder, the firm would be compensating the bondholder for the loss in general purchasing power of the dollars invested in that portion of the depreciable asset used up in the current accounting period. The loss is over the period between the date the asset was acquired with the proceeds of the sale of the bond and the date of the current income statement.

The inflation premium in interest is based on a different amount and is for a different period. The inflation premium in interest is considered compensation for the loss in the general purchasing power of all of the dollars invested, of the par value of the bond. And, the loss is only over the period covered by the current income statement.
Making one change, viz., assuming an actual rate of inflation is 12 per cent rather than 7 per cent, yields the data shown in Table XXI. With this change, the data in the table more closely approximate the actual inflation rate and actual inflation premiums during the latter part of the period covered by this study.

**TABLE XXI**

DIFFERENCE BETWEEN UOPP-HC DEPRECIATION AND UOM-HC DEPRECIATION COMPARED TO 7 PER CENT INFLATION PREMIUMS (ACTUAL INFLATION RATE: 12 PER CENT)

<table>
<thead>
<tr>
<th>End of Year</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) UOPP-HC Depreciation</td>
<td>224</td>
<td>248</td>
<td>272</td>
<td>296</td>
<td>320</td>
</tr>
<tr>
<td>UOM-HC Depreciation</td>
<td>200</td>
<td>200</td>
<td>200</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>Difference</td>
<td>24</td>
<td>48</td>
<td>72</td>
<td>96</td>
<td>120</td>
</tr>
<tr>
<td>(2) 7 Per Cent Inflation Premiums</td>
<td>70</td>
<td>70</td>
<td>70</td>
<td>70</td>
<td>70</td>
</tr>
</tbody>
</table>

With a 7 per cent inflation premium and a 12 per cent actual inflation rate, allocating the difference between UOPP-HC depreciation and UOM-HC depreciation would give the bondholder inflation compensation about equal to the total dollar compensation from premiums in interest—$360 ($24 + $48 + $72 + $96 + $120) compared to $350 ($70 + $70 + $70)
+ $70 + $70). The pattern of the payments, however, would be quite different.

The data in Tables XX and XXI demonstrate that inflation premiums in interest and preferred dividends may overstate or understate the dollar compensation that the difference between UOPP-HC depreciation and UOM-HC depreciation indicates is necessary (A) for accurate cost accounting and (B) to compensate senior security holders for purchasing power losses actually incurred, which is to say, to provide senior security holders the wherewithal with which they could maintain their real investments, the command over goods in general.

The data in Table XXI, with a 5 per cent spread between the inflation premium and the actual inflation rate, are probably more representative of the actual situation during much of the period covered in this study than the data in Table XX, with the inflation premium equal to the actual inflation rate. Thus the data in Table XXI help demonstrate what took place when bond-buyers and preferred stock-buyers incorrectly forecasted inflation rates. The data also help demonstrate the value of knowing the difference between total depreciation shortfall and the portion applicable to common stock.

The difference between UOPP-HC depreciation and UOM-HC depreciation not allocated to common measures the additional bonds and preferred stock that a firm would have to sell,
when old assets have to be replaced, to maintain the command over goods in general that the initial bondholders and preferred stockholders provided.

If replacement costs for that firm in particular rose the same amount as the cost of goods and services included in the gross national product implicit price deflator (or whatever other price index is used in computing UOPP-HC depreciation), the proceeds of that additional debt and preferred stock would be precisely the financial capital that the firm would need to renew its plant and equipment. This would be an unlikely coincidence.

Changes in the replacement costs for a particular firm are likely to diverge some, and maybe even a great deal, from the changes in the costs of goods and services generally. In this more likely case, the proceeds of the additional debt and preferred stock would provide the financial capital the firm would need to maintain its command over goods and services in general.

Conclusion

In the proportion that common equity provides the financial capital of a firm, it would seem appropriate to allocate to common equity that same proportion of the difference between UOPP-HC depreciation and UOM-HC depreciation. This is necessary to insure that what are called returns to common stockholders are truly returns on equity.
Because a firm can meet with UOM-HC depreciation all of its obligations to senior security holders that it presumes to meet via depreciation, it would not seem appropriate to allocate any of the difference between UOPP-HC depreciation and UOM-HC depreciation to those senior security holders.

Allocating to bondholders and preferred stockholders the difference between the total depreciation shortfall and the portion applicable to common stock is not equivalent to paying an inflation premium, in interest on bonds and in dividends on preferred stocks, equal to the actual rate of inflation.

Still, the difference between UOPP-HC depreciation and UOM-HC depreciation that is not allocated to common equity provides a vital function. That vital function is to show what increase is necessary in senior capital from one generation of fixed assets to the next if a firm is to maintain its real capital position. Unless common equity increases sufficiently—either through retained earnings or through UOPP-HC depreciation—to provide an equity base sufficient to support the increase in senior capital, the utility's financial position will be impaired—fatally if price inflation continues.
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