EXHIBIT NO. ___(RAM-21)
DOCKET NO. UE-060266/UG-060267
2006 PSE GENERAL RATE CASE
WITNESS: ROGER A. MORIN

BEFORE THE
WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION

WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION, **Complainant,** **v.** **PUGET SOUND ENERGY, INC.,** **Respondent.**	**Docket No. UE-060266** **Docket No. UG-060267**

SIXTH EXHIBIT (NONCONFIDENTIAL) TO THE
PREFILED REBUTTAL TESTIMONY OF
ROGER A. MORIN
ON BEHALF OF PUGET SOUND ENERGY, INC.

AUGUST 23, 2006

REGULATORY FINANCE:

UTILITIES' COST OF CAPITAL

Roger A. Morin, PhD

in collaboration with

Lisa Todd Hillman

1994
PUBLIC UTILITIES REPORTS, INC.
Arlington, Virginia

First Printing, March 1994
Library of Congress Catalog Card No. 94-66184
ISBN 0-910325-46-4

Printed in the United States of America

Chapter 7, the exact nature of the adjustment to the dividend yield becomes more complex and lies in excess of $1 + g$ if the quarterly timing of dividends and the interval between dividend payments are recognized.

Finally, if the conventional method of flotation cost adjustment is used by the regulator as discussed in the following chapter, the expected dividend yield must be adjusted for the underpricing allowance by dividing it by $1 - f$, where f is the underpricing allowance factor:

$$K = D_1/P_0(1 - f) + g \qquad (5\text{-}4)$$

5.3 Growth Estimates: Historical Growth

The principal difficulty in calculating the required return by the DCF approach is in ascertaining the growth rate that investors are currently expecting. While there is no infallible method for assessing what the growth rate is precisely, an explicit assumption about its magnitude cannot be avoided. Estimating the growth component is the most difficult and controversial step in implementing DCF since it is a quantity that lies buried in the minds of investors. Three general approaches to estimating expected growth can be used:

- historical growth rates
- analysts' forecasts
- sustainable growth rates

This section describes the historical growth approach while the next two sections address the other two approaches.

Historical growth rates in dividends, earnings, and book value are often used as proxies for investor expectations in DCF analysis. Investors are certainly influenced to some extent by historical growth rates in formulating their future growth expectations. In addition, these historical indicators are widely used by analysts, investors, and expert witnesses. A simple inventory of cost of capital testimonies over a reasonable time period in a given jurisdiction will reveal that DCF is widely used by academic and staff witnesses and that historical indicators are in wide usage in such testimonies. Professional certified financial analysts are also well versed in the use of historical growth indicators. To wit, the calculation of historical growth rates is normally one of the first steps in security analysis.

Historical indicators are also used extensively in scholarly research. There exists a vast literature in empirical finance designed to evaluate the use of historical information as surrogates for expected quantities.

When using historical growth rates in a regulatory environment, a convenient starting point is to focus on the utility in question, and to assume that its future growth is relatively stable and predictable. It is therefore reasonable to use past growth trends as one of many proxies for investor expectations. Historical rates of growth in earnings, dividends, market prices, and book values during some past period are among the most widely used proxies for expected growth. The fundamental assumption is made that investors arrive at their expected g by simply extrapolating past history. In other words, historical growth rates influence investor anticipations of long-run dividend growth rate.

In computing historical growth rates, three decisions must be made: (1) which historical data series is most relevant; (2) over what past period; and (3) which computational method is most appropriate.

Historical Series

DCF proponents have variously based their historical computations on earnings per share, dividends per share, and book value per share. Of the three possible growth rate measures, growth in dividends per share is likely to be preferable. After all, DCF theory states clearly that it is expected future cash flows in the form of dividends that constitute investment value.

Since the ability to pay dividends stems from a company's ability to generate earnings, growth in earnings per share can be expected to influence the market's dividend growth expectations. Dividend growth can only be sustained if there is growth in earnings. Using earnings growth as a surrogate for expected dividend growth can be difficult, however, since historical earnings per share are frequently more volatile than dividends per share.

Past growth rates of price and earnings per share tend to be very volatile and lead to unreasonable results, such as consistently negative growth rates. For example, in the 1970s and beginning of the 1980s especially, utility earnings growth rates were so unstable and volatile that they could not reasonably be expected to continue. Several empirical studies have shown that earnings growth rates are not persistent.[7] Dividend growth rates are considerably more stable as shown here in Table 5-1.

[7] The lack of persistence of earnings growth rates is documented in studies by Little (1962), Murphy (1966), and Lintner and Glauber (1967). The time series properties of earnings data are analysed in Brown and Rozeff (1978).

TABLE 5-1
GROWTH COMPUTATIONS FOR CONSOLIDATED NATURAL GAS

Year	Earnings Per Share	Dividends Per Share
1981	$1.86	$0.90
1982	$1.95	$0.96
1983	$1.96	$1.02
1984	$2.54	$1.10
1985	$2.58	$1.20
1986	$2.11	$1.37
1987	$2.24	$1.54
1988	$2.34	$1.67
1989	$2.20	$1.76
1990	$1.91	$1.85
1991	$1.94	$1.89
1992	$2.19	$1.90

Source: The Value Line Investment Survey

	Earnings Growth	Dividends Growth
- 3-year compound growth (1988-1991)	-1.32%	2.61%
- 10-year compound growth (1983-1992)	1.12%	6.42%
- 5-year compound growth (1988-1991) three year base periods	-2.06%	4.21%
- 10-year compound growth (1981-1991) three year base periods	0.46%	6.95%
- 5-year exponential growth (1988-1991)	-2.58%	3.29%
- 10-year exponential growth (1983-1991)	-1.35%	7.51%

Dividend growth rates are not nearly as affected by year-to-year inconsistencies in accounting procedures as are earnings growth rates, and they are not as likely to be distorted by an unusually poor or bad year. The relative stability of dividends versus earnings is discussed in the vast majority of college-level finance textbooks that discuss dividend policy. Because dividends track normalized earnings with a lag, and because of the information effect of dividend payments, they are necessarily more stable. Most companies, and utilities in particular, are reluctant to alter their dividend policy in response to transitory earnings variations.

Therefore, historical dividend growth is a more reliable proxy than historical earnings growth. Dividend growth is more stable than earnings growth, because dividends reflect normalized long-term earnings, rather than transitory earnings. Moreover, the DCF model clearly requires dividends as inputs to the model, for it is cash flows in the form of dividends that are the value generators.

One disadvantage of using dividends rather than earnings, however, is the discretionary aspect of dividends. Frequently, dividend increases are made in discrete, sometimes large steps, at management's discretion, and historical dividend growth may not be an adequate surrogate of the average expected growth over some future time period. Historical growth rates derived over specific periods can be biased by short-run changes in the dividend payout of a firm or through abnormal earnings that are unsustainable. A change in dividend policy would create growth in dividends that is more fictitious than real. Of course, if no change in long-run payout policy is anticipated, the expected average growth in dividends will equal the expected average growth in earnings.

Sustainable Versus Unsustainable Historical Growth

Past growth rates in earnings/dividends may be misleading if the past growth rates reflect an increase or a decrease in earned ROEs that are unsustainable or cannot be reasonably expected to continue in the distant future.

If historical ROEs have not been constant over the past 5 years, the mechanical extrapolation of historical earnings/dividends growth could imply that a similar pattern is expected to prevail over the next 5 years. In such a case, historical growth would not be an adequate proxy for expected growth to the extent that the trend in past ROEs is unsustainable or not expected to continue by investors. Under such circumstances, caution must be exercised in extrapolating past trends into the distant future. A more prudent procedure is to rely on analysts' growth forecasts that capture historical trends, the sustainability of such trends, and industry circumstances expected by investors.

It should be pointed out that if an increase in ROEs is expected by investors, the expected rate of growth in earnings will exceed the expected rate of growth in book value. Expected changes in ROE would result in the expected rate of growth in earnings per share being different from the expected rate of growth in book value per share. The converse is also true.

The standard infinite horizon DCF model projects the company's dividends into perpetuity. However, any single-growth variant of the standard DCF model is based on the assumption that dividends per share (DPS) and earnings per share (EPS) are expected to grow at some constant rate into perpetuity. The standard DCF model would be incorrectly specified when the investors' expected intermediate term EPS growth rate differs from the long-term sustainable EPS growth rate. When uneven growth is expected, it is inappropriate to use only the long-term sustainable EPS growth rate in the standard single-growth rate model. When growth rates are expected to vary, a two-growth rate DCF model is required to correctly identify the entire expected stream of future dividends reflected in the observed stock price. This was discussed earlier in Chapter 4.

Year to year changes in earnings and dividends can also be unduly influenced by changes in earned returns and/or changes in the dividend payout ratio. Past growth rates in earnings and dividends may be misleading if the past growth rates reflect an increase or a decrease in payout ratios that are unsustainable or cannot be reasonably expected to continue in the future forever.

If historical payout ratios have not been constant over the past 5 years, the extrapolation of historical earnings and dividends growth implies that a similar pattern is expected to prevail over the next 5 years. In such a case, historical growth may not be an adequate proxy for expected growth to the extent that the trend in past payout ratios is unsustainable or not expected to continue by investors. As stated previously, a more prudent procedure is to rely on analysts' growth forecasts.

If indeed the payout ratio is expected to change, the intermediate growth rate in dividends is not equal to the long-term growth rate, because dividend/earnings growth must adjust to the changing payout ratio. The implementation of a two-growth DCF model is required whenever assuming changing ROEs and/or payout ratios. For further discussion of the two-growth DCF model refer to Section 4.6 of Chapter 4.

Historical Growth of Book Value Per Share

Historical growth in book value per share may be a useful proxy for future dividend growth under certain limited circumstances. Book value per share tends to be less volatile than earnings per share or dividends per share. While book value is largely irrelevant for unregulated companies, it is a principal determinant of earnings for utilities in original cost jurisdictions because allowed earnings are determined by regulatory commissions on the basis of the level of book assets. Earnings per share is the product of book value per share and rate of return on book equity, so historical growth in book value per share may provide an indication of the growth in earnings that would have occurred if past rates of return had remained constant. Past growth in book value per share is an adequate proxy for future growth only if two crucial assumptions are met, however. First, that investors expect no change in earnings per share arising from changes in future book rate of return on equity. Second, that market-to-book ratios have remained stable. The latter assumption is vital, because book value may increase or decrease based on issuances of common stock at a premium or discount from existing book value. Growth from this source alone is largely unsustainable. An analysis of the historical relationship between per share earnings, book value, dividends, and the stability of earned returns on book equity and market-to-book ratios should provide valuable insights in assessing the merits of looking at history as a valid proxy for the future.[8]

Other historical series sometimes used by analysts as proxies for future dividend growth are revenues, assets, and net plant. Too many explicit assumptions are required to link the growth of these series with dividend growth. Reliance on such proxies is dangerous and unlikely to provide insights into future dividend growth. Some analysts average together the growth rate in customers, revenues, earnings, dividends, and book value. This procedure is highly questionable because only dividends and earnings are of interest. One might want to conduct a regression analysis to determine how growth in customers, sales, or book value influence growth in earnings and dividends, but otherwise the procedure is unjustified.

Time Period

Once an appropriate historical series has been selected, the period over which the growth is to be measured must be determined. The period must be long enough to avoid undue distortions by short-term influences and by abnormal years, and short enough to encompass current and foreseeable conditions relevant for investors' assessment of the future. Dividend growth over the past year is hardly representative of a trend. Similarly, it is meaningless to measure growth during a long period when dividend payout ratio was 60% and earned returns on book equity were 10% if investors, based on existing trends, expect the future payout to be 40% and future returns to be 13%.

Historical growth rates are customarily computed over the last 5 and 10 years. An average of the 5-year and 10-year growth rates is a reasonable compromise between the conflicting requirements of representativity and statistical adequacy.

A useful test of the reliability of historical growth as a surrogate for future growth is to measure its sensitivity to the period selected. If historical dividend growth is between 5% and 6%, regardless of the length of the period over which it is measured, one can conclude that the relationship between the historical growth rate and investors' expected growth rate is

[8] Changes in accounting practices can create problems of data comparability and consistency; the analysis should thus be confined to those years following the accounting changes. When using per share data series, care must be taken to include changes in capitalization, such as stock splits and stock dividends.

reliable. If the computed growth rate is highly sensitive to the length of the period, then it does not provide useful information.

The computation of historical growth rates requires a time period that is long enough to be statistically valid and short enough to be topical and current. Five- and 10-year periods have been adopted by several investment advisory services in reporting such historical growth rates as well as the forecasts of such growth rates. A 5- or 10-year measurement period is the accepted compromise in finance literature and the securities industry. Five-year horizons are routinely employed by financial analysts.

Value Line reports both 5- and 10-year historical growth in earnings, dividends, book value, cash flow, and revenues. Computerized data bases such as Compustat, and Value Line's "Value Screen III" software also report 5-year historical growth rates. In addition, many long term analysts' forecasts are reported for 5-year periods, such as those for Institutional Brokers Estimate System (IBES) and Zack's Earnings Estimator. Such information would not be reported unless it possessed value in excess of its production costs to investors, whether for informational, forecasting, or analytical purposes.

Growth Rate Computation

The method of calculating growth is most meaningful in the context of compound interest. If dividends grow from $2 to $3 over a 10-year period, for example, the total growth is 50%, or a simple average per annum rate of 5%. But 5% is not a meaningful expression of the growth rate because it ignores compounding, that is, the accrual of interest on interest as well as on the original value. Assuming annual compounding, $2 grows to $3 in 10 years at a rate of 4.1%. The latter can be obtained either from standard compound interest tables or from a specialized financial calculator.

Use of the compounding method of calculating growth is vulnerable to a potential distortion. If either the initial or terminal values are unrepresentative because they are unusually high or low, the resulting growth rate will not truly reflect the developments during the period. For example, if the terminal year happens to be one of severely depressed earnings due to inflation or acute regulatory lag, and the initial year one of boom, the indicated growth rate will be unrealistically low. The reverse may also be true. This potential distortion can be avoided in one of two ways. Either select initial and terminal end points that have similar economic characteristics, or do not use single year's data, but rather the averages of the first few and last few years' data as end points. The latter method is preferable because it involves less subjective judgement. The historical 5-year and 10-year compound growth rates available in the

Value Line Data Base for earnings, dividends, book value, revenues, and cash flows are computed in this manner. Base periods used by Value Line are 3-year averages in order to temper cyclicality and to mitigate any potential distortion due to sensitivity to end points in the calculation.

A more sophisticated method of calculating a growth rate is to fit a "least-squares line" to the logarithms of all the data in the series. This method is known under various names, such as log-linear trend line, log-linear regression, or least-squares exponential regression analysis. To implement the method, as demonstrated in Kihm and Rankin (1988), express the expected dividend for any year t as the current dividend compounded over t years:

$$D_t = D_0 (1 + g)^t \qquad (5\text{-}4)$$

Taking natural logarithms on both sides, hence the name log-linear trend line, we get:

$$\ln D_t = \ln D_0 (1 + g)^t$$

$$\ln D_t = \ln D_0 + t \ln (1 + g)^t$$

$$\ln D_t - \ln D_0 = t \ln (1 + g)^t \qquad (5\text{-}5)$$

The reason for employing the logarithm of dividends rather than raw dividends is because the slope of a line fitted through the raw data points represents a percentage increase, or growth rate per year, instead of merely a fixed dollar increase per period. A constant dollar increase per period implies a declining growth rate. The average growth rate computed using the log-linear approach is more useful because log-linear growth rates are not distorted by changes in the dollar level. In essence, the log-linear approach solves the so-called scale problem. The log-linear approach is therefore preferable to the raw linear approach.

Letting $\ln D_t - \ln D_0 = y$ and $\ln (1 + g)^t = b$, we have the simple expression:

$$y = tb \qquad (5\text{-}6)$$

The y is the historical dividends and t the time periods. Since both y and t are known, the term b can easily be estimated by simple regression, with the constant suppressed. The historical growth rate over the period can then be inferred from the estimate of b as follows:

$$b = \ln(1 + g)$$

$$e^b = e^{\ln(1+g)} = 1 + g$$

$$g = e^b - 1 \tag{5-7}$$

The log-linear method is theoretically more precise than the compound growth rate method in that it weighs each observation equally rather than including just the end points. In normal circumstances, however, the added precision is not worth the substantial extra calculation effort. In certain extreme cases, the usefulness of the growth proxy may be improved if one or more abnormal years are omitted or adjusted.

The numerical example shown in Table 5-1 portrays a history of Consolidated Natural Gas Company's earnings and dividends per share. Compound growth rates, smoothed compound growth rates, and exponential growth rates for earnings and dividends are computed for the last 10 and 5 years. Compound growth is computed by solving the orthodox compound value formula for g:

$$F = P(1 + g)^n \tag{5-8}$$

where F = terminal value, P = initial value, and n = number of periods. For example, to get the 10-year dividend growth rate, the following formula is solved for g by either consulting standard compound interest tables or by using a financial calculator:

$$1.90 = 1.02(1 + g)^{10}$$

Base periods used in the computation of the smoothed compound growth rates are 3-year averages in order to temper cyclicality and reduce sensitivity to end points. For example, base periods for the 5-year and 10-year growth rate calculations through the end of 1992 are 1990-1992 versus 1986-1988 and 1981-1983, respectively. The exponential growth rates are obtained from Equation 5-7 through least-squares regression techniques.

Kihm and Rankin (1988) investigated the accuracy of various historical methods to estimate growth by checking actual dividend growth over 5- and 10-year periods with forecast dividend growth rates derived from various methods. The log-linear least-squares estimate based on 10 years of historical data outperformed other techniques. A simple 10-year or 5-year average of dividend growth rates also produced low forecast error. Dividend-based methods outperformed earnings-based methods. The sustainable growth method, discussed in Section 5.5, fared poorly.

Hazards of Historical Growth Rates

Past growth rates in earnings or dividends may be misleading, since past growth rates may reflect changes in the underlying relevant variables that cannot reasonably be expected to continue in the future, or may fail to capture known future changes.

The future need not be like the past. For example, assets may grow at a different rate, or utilities may be more or less profitable. Since investors take such factors into account in assessing future earnings and dividends, historical growth rates could provide a misleading proxy for future growth.

The standard DCF model assumes that a company will have a stable dividend payout policy and a stable earned return on book equity, and thus that earnings, dividends, and book value per share will in the future grow at the same rate. The DCF model also assumes that the financing mix, that is the proportions used of retained earnings, debt, and new stock issues, remains constant. If they change, the growth rates will change and the past growth rates will not reflect future growth rates. While it is appropriate to make such assumptions for forecasting purposes, these assumptions are frequently violated when examining historical data. Payout ratios or earned returns on equity may have been historically unstable, and hence earnings, dividends, and book value did not grow at the same growth rate.

It is customary and conceptually correct for forecasting purposes to assume that a utility will experience a constant payout ratio and thus that earnings and dividends will in the future grow at comparable rates over some given time period. As a matter of fact, these are the core assumptions incorporated in the DCF model. But if one is looking at historical data, or at short-term growth forecasts where payout ratios are not stable, then earnings and dividends may not grow at the same rate over some past historical period or over some short forecast period. But from a prospective viewpoint, the DCF fundamentally assumes that earnings and dividends will grow at the same rate.

This was certainly the case for most utilities in the 1970s and beginning of the 1980s when double-digit inflation increased plant, capital, and operating costs while regulatory lag held down price increases. The depressing effect of inflation on utility earnings, dividend, and book value growth was compounded by the necessity to sell stock at prices below book value, which diluted book value and retarded growth further. These low historical growth rates were not representative of future growth rates and could not be extrapolated into the future. The utility industry experienced a turnaround starting in the early 1980s. Inflation abated, utilities were authorized and were earning higher rates of return than in earlier years, and market-to-book ratios increased, so that stock sales no longer diluted book value to the same extent they did earlier. As a result, security analysts and investors were forecasting higher growth rates in the future compared to the past.

A good example of the danger of relying on historical growth rates is provided by the telecommunications industry in the early 1990s. The 5-year historical period before the early 1990s was characterized by non-recurring events that biased historical growth rates, such as cellular investments with heavy startup costs, acquisitions, diversification programs, or write-offs. The latter activities exerted a dilutive effect on historical earnings and dividends for several telephone companies during that period. Several of these companies' earnings growth were unrepresentative of future growth. Analysts' growth forecasts provided a more realistic and representative growth proxy for what was likely to happen in the future. If historical growth rates are to be representative of long-term future growth rates, they must not be biased by non-recurring events or by structural shifts in the fundamentals of the company.

Table 5-2 and Figure 5-1, taken from Brigham (1983), provide an interesting demonstration of how historical book value growth rate is a downward-biased estimator of future growth if the book return on equity has been rising. Brigham's demonstration works in reverse as well, that is, if earned returns were falling, historical growth would overestimate future growth.

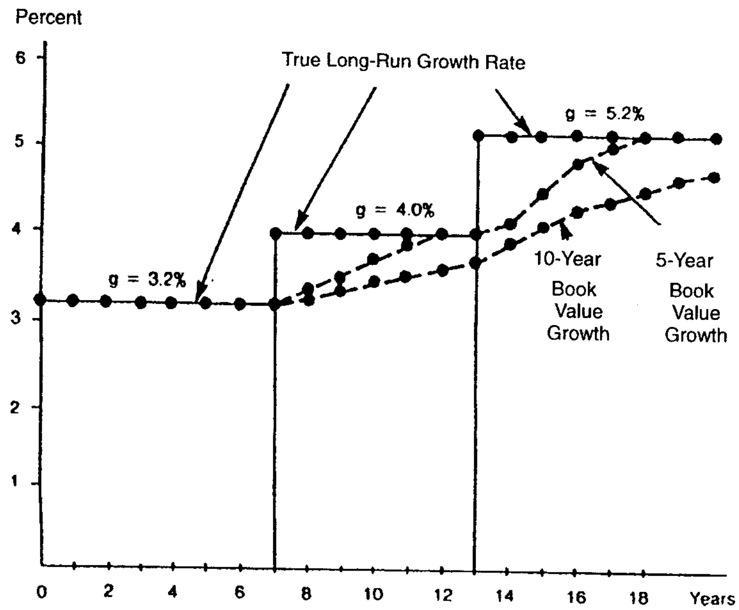
To illustrate the dangers of historical growth, Gordon (1974, 1977) showed what happens to historical earnings growth when return on equity is increased. As displayed in Table 5-3, with a 4% earnings growth before period 4, and a 6% growth rate after period 4, the arithmetic mean rate of growth over the 5 years is 18%. This is due to an increase in book equity return from 10% to 15% and the 56% earnings growth in period 4. Extrapolation of the 18% growth rate over this 5-year period would appear to be quite unreasonable.

TABLE 5-2
ILLUSTRATION OF GROWTH RATE ESTIMATES

						Predicated Growth Rate, Based On				
						Past Data (5-Year Averages)			Expected Date g = b (ROE) = (1-POR) (ROE)	Actual Growth Rates in EPS, DPS
Year	ROE	Book Value Per Share, BVPS (Beginning of Year)	Earnings Per Share, EPS (BVPS x ROE)	Payout Rate (POR)	Dividends Per Share, DPS (EPS x POR)	BVPS	EPS	DPS		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1	0.08	$10.0000	$0.8000	0.60	0.4800	-	-	-	3.20	3.20%
2	0.08	$10.3200	$0.8256	0.60	0.4954	-	-	-	3.20	3.20%
3	0.08	$10.6502	$0.8520	0.60	0.5112	-	-	-	3.20	3.20%
4	0.08	$10.9910	$0.8793	0.60	0.5276	-	-	-	3.20	3.20%
5	0.08	$11.3427	$0.9074	0.60	0.5445	3.15%	3.15%	3.15%	3.20	3.20%
6	0.08	$11.7056	$0.9365	0.60	0.5619	3.15%	3.15%	3.15%	3.20	3.20%
7	0.10	$12.0802	$1.2080	0.60	0.7248	3.15%	7.61%	7.61%	4.00	28.99%
8	0.10	$12.5636	$1.2564	0.60	0.7538	3.30%	10.00%	10.00%	4.00	4.00%
9	0.10	$13.0662	$1.3066	0.60	0.7840	3.54%	10.23%	10.23%	4.00	4.00%
10	0.10	$13.5888	$1.3589	0.60	0.8153	3.77%	8.23%	8.23%	4.00	4.00%
11	0.10	$14.1324	$1.4132	0.60	0.8479	3.92%	3.92%	3.92%	4.00	4.00%
12	0.10	$14.6977	$1.4698	0.60	0.8819	3.92%	3.92%	3.92%	4.00	4.00%
13	0.13	$15.2856	$1.9871	0.60	1.1923	3.92%	9.17%	9.17%	5.20	35.20%
14	0.13	$16.0804	$2.0905	0.60	1.2543	4.15%	12.02%	12.02%	5.20	5.20%
15	0.13	$16.9166	$2.1992	0.60	1.3195	4.50%	12.37%	12.37%	5.20	5.20%
16	0.13	$17.7963	$2.3135	0.60	1.3881	4.84%	10.09%	10.09%	5.20	5.20%
17	0.13	$18.7217	$2.4338	0.60	1.4603	5.07%	5.07%	5.07%	5.20	5.20%
18	0.13	$19.6952	$2.5604	0.60	1.5362	5.07%	5.07%	5.07%	5.20	5.20%

Source: Brigham (1983)

FIGURE 5-1
THE HAZARDS OF HISTORICAL GROWTH RATES



Source: Brigham (1983)

TABLE 5-3
THE IMPACT OF A CHANGE IN RATE OF RETURN ON EARNINGS GROWTH

Year	Book Value 1	Earnings Per Share 2	Dividends Per Share 3	Retained Earnings 4	Growth Rate of Earnings 5
1	$10.00	$1.00	$0.60	$0.40	
2	$10.40	$1.04	$0.62	$0.42	4.00%
3	$10.82	$1.08	$0.65	$0.43	4.00%
4	$11.25	$1.69	$1.01	$0.67	56.00%
5	$11.92	$1.79	$1.07	$0.72	6.00%
6	$12.64	$1.90	$1.14	$0.76	6.00%

Column (1): Value for previous year plus retained earnings in previous year
Column (2): 10% of book value in first 3 years, and 15% of book value in last 3 years
Column (3): 60% of earnings
Column (4): 40% of earnings

Source: Gordon (1974, 1977)

Another potential problem with the use of historical growth rates is that there is no convenient method to adjust the results if the company's risk changes. For example, the stock price of an electric utility that diversifies into oil exploration or solar conservation reflects both the risk of electric generation and of peripheral energy activities. Historical growth rates may be quite different from those expected in the future.

The major point of all this is that it is perilous to apply historical growth when a utility is in a transition between growth paths. When payout ratios, equity return, and market-to-book ratios are changing, reliance on historical growth is hazardous. Such transitions can occur under variable inflation environments, and under fundamental environmental shifts, such as deregulation.

Given the choice of variables, length of historical period, and the choice of statistical methodologies, the number of permutations and combinations of historical growth rates is such that other methods and proxies for expected growth must be explored. Historical growth rates constitute a useful starting point and provide useful information as long as the necessary conditions and assumptions outlined in this section are not dramatically violated. Although historical information provides a primary foundation for expectations, investors use additional information to supplement past growth rates. Extrapolating past history alone without consideration of historical trends and anticipated economic events would assume either that past rates will persist over time or that investors' expectations are based entirely on history. Analysts' forecasts provide a supplementary source of information on growth expectations.

5.4 Growth Estimates: Analysts' Forecasts

Since investor growth expectations are the quantities desired in the DCF model, the use of forecast growth published by investment services merits serious consideration. The growth rates assumed by investors can be determined by a study of the analyses of future earnings and projected long-run growth rates made by the investment community. The anticipated long-run growth rates actually used by institutional investors to determine the desirability of investing in different securities influence investors' growth anticipations.

Typically, growth forecasts are in the form of earnings per share and dividends per share over periods ranging from 1 to 5 years, and are supported by extensive financial analysis. The average growth rate estimate for dividends and earnings measures the consensus expectation of the investment community.

In many cases, it is necessary to use earnings forecasts rather than dividend forecasts due to the extreme scarcity of dividend forecasts compared to the availability of earnings forecasts. Given the paucity and variability of dividend forecasts, using the latter would produce unreliable DCF results. In any event, the use of the DCF model prospectively assumes constant growth in both earnings and dividends. Moreover, there is an abundance of empirical research that shows the validity and superiority of earnings forecasts to estimate the cost of capital.

The uniformity of such growth projections are a test of whether they are typical of the market as a whole. If, for example, 10 out of 15 analysts forecast growth in the 7%–9% range, the probability is high that their analysis reflects a degree of consensus in the market as a whole.

Because of the dominance of institutional investors and their influence on individual investors, analysts' forecasts of long-run growth rates provide a sound basis for estimating required returns.[9] Financial analysts also exert a strong influence on the expectations of many investors who do not possess the resources to make their own forecasts, that is, they are a cause of *g*. The accuracy of these forecasts in the sense of whether they turn out to be correct is not at issue here, as long as they reflect widely held expectations. As long as the forecasts are typical and/or influential in that they are consistent with current stock price levels, they are relevant. The use of analysts' forecasts in the DCF model is sometimes denounced on the grounds that it is difficult to forecast earnings and dividends for only one year, let alone for longer time periods. This objection is unfounded, however, because it is present investor expectations that are being priced; it is the consensus forecast that is embedded in price and therefore in required return, not the future as it will turn out to be.

Published studies in the academic literature demonstrate that growth forecasts made by security analysts represent an appropriate source of DCF growth rates, are reasonable indicators of investor expectations and are more accurate than forecasts based on historical growth. These studies show that investors rely on analysts' forecasts to a greater extent than on historic data only. A study by Brown and Rozeff (1978) showed that analysts, as proxied by Value Line analysts, make better forecasts than could be obtained using only historical data, because analysts have available not only past data but also a knowledge of such crucial factors as rate case decisions, construction programs, new products, cost data, and so on. Brown and Rozeff tested the accuracy of analysts' forecasts versus fore-

---

[9] The rest of this section is adapted from Brigham (1983).

casts based on past data only, and concluded that their evidence of superior analyses means that analysts' forecasts should be used in studies of cost of capital. Their evidence supports the hypothesis that Value Line analysts consistently make better predictions than time series models.

Cragg and Malkiel (1982) presented detailed empirical evidence that the average analyst's expectation is more similar to expectations being reflected in the marketplace than are historical growth rates, and that they represent the best possible source of DCF growth rates. Cragg and Malkiel showed that historical growth rates do not contain any information that is not already impounded in analysts' growth forecasts. A study by Vander Weide and Carleton (1988) also confirmed the superiority of analysts' forecasts over historical growth extrapolations. A study by Timme and Eiseman (1989) produced similar results. Empirical studies have also been conducted showing that investors who rely primarily on data obtained from several large reputable investment research houses and security dealers obtain better results than those who do not.[10] Thus, both empirical research and common sense indicate that investors rely primarily on analysts' growth rate forecasts rather than on historical growth rates alone.

Ideally, one could decide which analysts make the most reliable forecasts and then confine the analysis to those forecasts. This would be impractical since reliable data on past forecasts are generally not available. Moreover, analysts with poor track records are replaced by more competent analysts, so that a poor forecasting record by a particular firm is not necessarily indicative of poor future forecasts. In any event, analysts working for large brokerage firms typically have a following, and investors who heed a particular analyst's recommendations do exert an influence on the market. So, an average of all the available forecasts from large reputable investment houses is likely to produce the best DCF growth rate.

Growth rate forecasts of several analysts are available from published sources. For example, the IBES (Institutional Brokers Estimate System) publication tabulates analysts' earnings forecasts on a regular basis by conducting a monthly survey of the earnings growth forecasts of a large number of investment advisors, brokerage houses, and other firms that engage in fundamental research on U.S. corporations. IBES forecasts are a product of Lynch, Jones, and Ryan, a major brokerage firm that collects and disseminates such forecasts. Data in IBES represent a compilation of earnings per share estimates of about 2,000 individual analysts from 100

[10] Examples of such studies include Stanley, Lewellen, and Schlarbaum (1981) and Touche Ross Co. (1982).

brokerage firms on over 2,000 corporations. The client base includes most large institutional investors, such as pension funds, banks, and insurance companies. Representative of industry practices, IBES contains estimates of earnings per share for the upcoming 2 fiscal years, and a projected 5-year growth rate in such earnings per share. Each item is available at monthly intervals. IBES collection procedures are designed to obtain timely forecasts made on a consistent basis. IBES requests normalized 5-year growth rates from analysts. Such normalization is designed to remove short-term distortions. Forecasts are updated when analysts formally change their stated predictions. IBES does, however, verify prior forecasts monthly to make sure that analysts still hold to them. Zacks Investment Service also provides analysts' growth forecasts, and these are conveniently available on-line through the Dow Jones News Retrieval Service.

Exclusive reliance on a single analyst's growth forecast runs the risk of being unrepresentative of investors' consensus forecast. One would expect that averages of analysts' growth forecasts, such as those contained in IBES or Zacks, are more reliable estimates of investors' consensus expectations likely to be impounded in stock prices. Moreover, the empirical finance literature has shown that consensus analysts' growth forecasts are reflected in stock prices, possess a high explanatory power of equity values, and are used by investors. Averages of analysts' growth forecasts are more reliable estimates of investors' consensus expectations.

One problem with the use of published analysts' forecasts is that some forecasts cover only the next 1 or 2 years. If these are abnormal years, they may not be indicative of longer-run average growth expectations. Another problem is that forecasts may not be available in sufficient quantities or may not be available at all for certain utilities, for example water utilities, in which case, alternate methods of growth estimation must be employed.

Some analysts are uncomfortable with the assumption that the DCF growth rates are perpetual growth rates, and argue that above average growth can be expected to prevail for a fixed number of years and then the growth rate will settle down to a steady-state, long-run level, consistent with that of the economy. The converse can also be true whereby below average growth can be expected to prevail for a fixed number of years and then the growth rate will resume a higher steady-state, long-run level. Extended DCF models are available to accomodate such assumptions, and were discussed in Chapter 4.

Historical Growth Rates Versus Analysts' Forecasts

Obviously, historical growth rates as well as analysts' forecasts provide relevant information to the investor with regard to growth expectations. In view of the empirical evidence and the conceptual discussion of the previous sections, and provided no structural shift in industry fundamentals have occurred, equal weight should be accorded to DCF results based on history and those based on analysts' forecasts. Each proxy for expected growth brings information to the judgment process from a different light. Neither proxy is without blemish, each has advantages and shortcomings. Historical growth rates are available and easily verifiable, but may no longer be applicable if structural shifts have occurred. Analysts' growth forecasts may be more relevant since they encompass both history and current changes, but are nevertheless imperfect proxies.

5.5 Growth Estimates: Sustainable Growth Method

Another method, alternately referred to as the "ploughback," "sustainable growth," and "retention ratio" method, can be used by investment analysts to predict future growth in earnings and dividends. In this method the fraction of earnings expected to be retained by the company, b, is multiplied by the expected return on book equity, r. That is,

$$g = b \times r$$

The conceptual premise of the method, enunciated in Chapter 4, Section 4.4, is that future growth in dividends for existing equity can only occur if a portion of the overall return to investors is reinvested into the firm instead of being distributed as dividends.

For example, if a company earns 12% on equity, and pays all the earnings out in dividends, the retention factor, b, is zero and earnings per share will not grow. Conversely, if the company retains all its earnings and pays no dividends, it would grow at an annual rate of 12%. Or again, if the company earns 12% on equity and pays out 60% of the earnings in dividends, the retention factor is 40%, and earnings growth will be 40% x 12% = 4.8% per year.

In implementing the method, the retention rate, b, should be the rate that the market expects to prevail in the future. If no explicit forecast is available, it is reasonable to assume that the utility's future retention ratio will, on average, remain unchanged from its present level. Or, it can be estimated by taking a weighted average of past retention ratios as a proxy for the future on the grounds that utilities' target retention ratios are usually, although not always, stable.[11]

Both historical and forecast values of r can be used to estimate g, although forecast values are superior. The use of historical realized book returns on equity rather than the expected return on equity is questionable since reliance on achieved results involves circular reasoning. Realized returns are the results of the regulatory process itself, and are also subject to tests of fairness and reasonableness. As a gauge of the expected return on book equity, either direct published analysts' forecasts of the long-run expected return on equity, or authorized rates of return in recent regulatory cases can be used as a guide. As a floor estimate, it seems reasonable for investors to expect allowed equity returns by state regulatory commissions to be in excess of the current cost of debt to the utility in question.

Another way of estimating the return on equity investors are expecting was proposed by Copeland (1979). Since earnings per share, E, can be stated as dividends per share, D, divided by the payout ratio $(1 - b)$, the earnings per share capitalized by investors can be inferred by dividing the current dividend by an expected payout ratio. Since most utilities follow a fairly stable dividend policy, the possibility of error is less when estimating the payout than when estimating the expected return on equity or the expected growth rate. Using this approach, and denoting book value per share by B, the expected return on equity is:

$$r = E/B = (D/(1 - b))/B \qquad (5\text{-}9)$$

Estimates of the expected payout ratio can be inferred from historical 10-year average payout ratio data for utilities. Since individual averages frequently tend to regress toward the grand mean, the historical payout ratio needs to be adjusted for this tendency, using statistical techniques for predicting future values based on this tendency of individual values to regress toward the grand mean over time.

An application of the sustainable growth method is shown in the following hypothetical example.

[11] Statistically superior predictions of future averages are made by weighting individual past averages with the grand mean, with the variance within the individual averages and the variance across individual averages serving as weights. See Efron and Morris (1975) for an excellent discussion of this method.

EXAMPLE 5-1

Southeastern Electric's sustainable growth rate is required for an upcoming rate case testimony. As a gauge of the expected return on equity, authorized rates of return in recent decisions for Eastern U.S. electric utilities as reported by Value Line for 1993 and 1994 averaged 12%, with a standard deviation of 1%. In other words, the majority of those utilities were authorized to earn 12%, with the allowed return on equity ranging from 11% to 13%. As a gauge of the expected retention ratio, the average 1993 payout ratio of 34 eastern electric utilities as compiled by Value Line was 60%, which indicates an average retention ratio of 40%, with a standard deviation of some 5%. This was consistent with the long-run target retention ratio indicated by the management of The Southeastern Electric. It is therefore reasonable to postulate that investors expect a retention ratio ranging from 35% to 45% for the company with a likely value of 40%. In Table 5-4 below, expected retention ratios of 35% to 45% and assumed returns on equity from 11% to 13% are combined to produce growth rates ranging from 3.8% to 5.4% with a likely value of 4.6%.

TABLE 5-4
ILLUSTRATION OF THE SUSTAINABLE GROWTH METHOD
EXPECTED GROWTH RATE: $g + br$

Expected Retention Ratio (b)	Expected Return on Book Equity (r) 11%	12%	13%
35%	3.85%	4.20%	4.55%
40%	4.40%	4.80%	5.20%
45%	4.95%	5.40%	5.85%

It should be pointed out that published forecasts of the expected return on equity by analysts such as Value Line are sometimes based on end-of-period book equity rather than on average book equity. The following formula[12] adjusts the reported end-of-year values so that they are based on average common equity, which is the common regulatory practice:

12 The return on year-end common equity, r, is defined as $r = E/B_t$, where E is earnings per share, and B is the year-end book value per share. The return on average common equity, r_a, is defined as:

$$r_a = E/B_a$$

$$r_a = r_t \frac{2B_t}{B_t + B_{t-1}} \qquad (5\text{-}10)$$

where r_a = return on average equity

r_t = return on year-end equity as reported

B_t = reported year-end book equity of the current year

B_{t-1} = reported year-end book equity of the previous year

The sustainable growth method can also be extended to include external financing. From Chapter 4, the expanded growth estimate is given by:

$$g = br + sv$$

where b and r are defined as previously, s is the expected percent growth in number of shares to finance investment, and v is the profitability of the equity investment. The variable s measures the long-run expected stock financing that the utility will undertake. If the utility's investments are growing at a stable rate and if the earnings retention rate is also stable, then s will grow at a stable rate. The variable s can be estimated by taking a weighted average of past percentage increases in the number of shares. This measurement is difficult, however, owing to the sporadic and episodic nature of stock financing, and smoothing techniques must be employed. The variable v is the profitability of the equity investment and can be measured as the difference of market price and book value per share divided by the latter, as discussed in Chapter 4.

---

12 (continued)

where B_a = average book value per share. The latter is by definition:

$$B_a = \frac{B_t + B_{t-1}}{2}$$

where B_t, is the year-end book equity per share and B_{t-1} is the beginning-of-year book equity per share. Dividing r by r_a and substituting:

$$\frac{r}{r_a} = \frac{E/B_t}{E/B_a} = \frac{B_a}{B_t} + \frac{B_t + b_{t-1}}{2B_t}$$

Solving for r_a, a formula for translating the return on year-end equity into the return on average equity is obtained, using reported beginning-of-the year and end-of-year common equity figures:

$$r_a = r\frac{2B_t}{B_t + B_{t-1}}$$

Generally
sustainak
to estima
what g tl
tious to u
relying oı
seems on
in using f
ing error

Second, t
forecast
determin
the mind
of the oı
regulatoı
the ROE
return oı
words, tl
even be i
return or
that the
an expec
and usin
inconsist
to earn 1
way this
the utilit

One is a
exceedin
mending
an ROE i
cost of eq

The circ
nature o
will incr
lowering
for the l
hearing,
dual coı
partially

Generally, there are three problems in the practical application of the sustainable growth method. The first is that it may be even more difficult to estimate what *b*, *r*, *s*, and *v* investors have in mind than it is to estimate what *g* they envisage. It would appear far more economical and expeditious to use available growth forecasts and obtain *g* directly instead of relying on four individual forecasts of the determinants of such growth. It seems only logical that the measurement and forecasting errors inherent in using four different variables to predict growth far exceed the forecasting error inherent in a direct forecast of growth itself.

Second, there is a potential element of circularity in estimating *g* by a forecast of *b* and ROE for the utility being regulated, since ROE is determined in large part by regulation. To estimate what ROE resides in the minds of investors is equivalent to estimating the market's assessment of the outcome of regulatory hearings. Expected ROE is exactly what regulatory commissions set in determining an allowed rate of return. If the ROE input required by the model differs from the recommended return on equity, a fundamental contradiction in logic follows. In other words, the method requires an estimate of return on equity before it can even be implemented. Common sense would dictate the inconsistency of a return on equity recommendation that is different than the expected ROE that the method assumes the utility will earn forever. For example, using an expected return on equity ROE of 13% to determine the growth rate and using the growth rate to recommend a return on equity of 11.5% is inconsistent. It is not reasonable to assume that this company is expected to earn 13% forever, but recommend an 11.5% return on equity. The only way this utility can earn 13% is that rates be set by the regulator so that the utility will in fact earn 13%.

One is assuming, in effect, that the company will earn at a return rate exceeding the recommended cost of equity forever, but then one is recommending that a different rate be granted by the regulator. In essence, using an ROE in the sustainable growth formula that differs from the final estimated cost of equity is asking the regulator to adopt two different returns.

The circularity problem is somewhat dampened by the self-correcting nature of the DCF model. If a high equity return is granted the stock price will increase in response to the unanticipated favorable return allowance, lowering the dividend yield component of market return in compensation for the high *g* induced by the high allowed return. At the next regulatory hearing, more conservative forecasts of *r* would prevail. The impact on the dual components of the DCF formula, yield and growth, are at least partially offsetting.

Thirdly, the empirical finance literature demonstrates that the sustainable growth method of determining growth is not as significantly correlated to measures of value, such as stock price and price/earnings ratios, as other historical growth measures or analysts' growth forecasts. Other proxies for growth, such as historical growth rates and analysts' growth forecasts, outperform retention growth estimates. See for example Kihm and Rankin (1988) and Timme and Eiseman (1989).

In summary, of the three proxies for the expected growth component of the DCF model, historical growth rates, analysts' forecasts, and the sustainable growth method, the latter is the least desirable. Criteria in choosing among the three proxies should include ease of use, ease of understanding, theoretical and mathematical correctness, and empirical validation. The latter two are crucial. The method should be logically valid and consistent, and should possess an adequate track record in predicting and explaining security value. The retention growth method is the weakest of the three proxies on both conceptual and empirical grounds. The empirical validity of the method is crucial in deciding which of the three proxies to employ. The research in this area has shown that the first two growth proxies do a better job of explaining variations in market valuation (M/B and P/E ratios) and are more highly correlated to measures of value than is the retention growth proxy.

References

Brealey, R. and Myers, S. *Principles of Corporate Finance,* 4th ed. New York: McGraw-Hill, 1991.

Brigham, E.F. Pennsylvania Electric Company, Rebuttal Testimony, Pennsylvania Public Utility Commission, Docket No. ER79-88, 1983.

Brown. L.D. and Rozeff, M.S. "The Superiority of Analyst Forecasts as Measures of Expectations: Evidence from Earnings." *Journal of Finance,* March 1978, 1-16.

Cohen, J.B., Zinbarg, E.D., and Zeikel A. *Investment Analysis and Portfolio Management,* 5th ed. Homewood IL: Richard D. Irwin, 1987.

Copeland, B.L. "The Cost of Equity Capital: A Model for Regulatory Review." In *Issues in Public Utility Regulation,* edited by H.M. Trebing, 342-366. East Lansing MI: Michigan State University, 1979.

Cragg, J.G. and Malkiel, B.G. "Expectations and the Structure of Share Prices." National Bureau of Economic Research. Chicago: University of Chicago Press, 1982.