volume of trading on public exchanges, and a ceiling on the amount of dividend cuts over a past period.

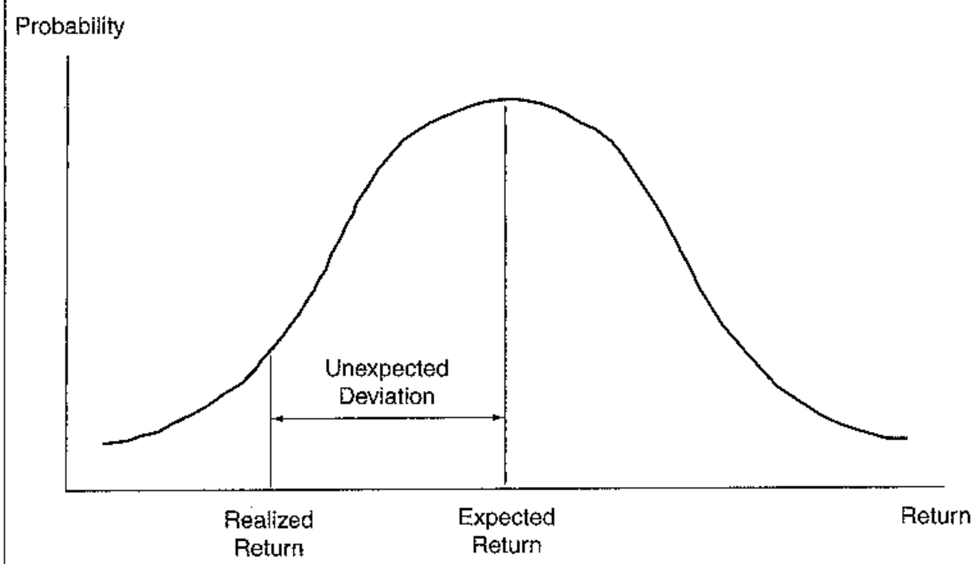
In defining a population of comparable-risk companies, care must be taken not to include other utilities in the sample, since the rate of return on other utilities depends on the allowed rate of return. The historical book return on equity for regulated firms is not determined by competitive forces but instead reflects the past actions of regulatory commissions. It would be circular to set a fair return based on the past actions of other regulators, much like observing a series of duplicate images in multiple mirrors. The rates of return earned by other regulated utilities may very well have been reasonable under historical conditions, but they are still subject to tests of reasonableness under current and prospective conditions.

Time Period

The cost of capital of a company refers to the expected long-run earnings level of other firms with similar risk. But a company's achieved earnings in any given year are likely to exceed or be less than their long-run average. Such deviations from expectations occur at the macroeconomic level as well. At the peak of the business cycle, firms generally earn more than their cost of capital, while at the trough the reverse is typical. Aggregating returns over a large number of comparable-risk unregulated firms averages the abnormally high and low rates of profitability in any given year. Furthermore, to dampen cyclical aberrations and remove the effects of cyclical peaks and troughs in profitability, an average over several time periods should be employed. The time period should include at least one full business cycle that is representative of prospective economic conditions for the next cycle. Such cyclical variations can be gauged by the official turning points in the U.S. business cycle, reported in *Business Conditions Digest*.

Averaging achieved returns over a full business cycle can serve as a reasonable compromise between the dual objectives of being representative of current economic conditions and of smoothing out cyclical fluctuations in earnings on unregulated firms. Some analysts confine their return study to the most recent time period. The most serious flaw of this approach is that historical returns on equity vary from year to year, responding to the cyclical forces of recession and expansion and to economic, industry-specific and company-specific trends. The most recent period is not likely to mirror expectations and be representative of prospective business conditions. Moreover, in the short run, reported book profitability frequently moves in the opposite direction to interest rates and to investors' required returns. For example, a period of disinflation and falling interest rates will increase company earnings and earned equity returns, while investors' return requirements are falling, and conversely.

FIGURE 13-1
PROBABILITY DISTRIBUTION OF RETURNS
EXPECTED VS. REALIZED OUTCOME



The fundamental issue is whether realized book returns are an adequate surrogate for expected returns. To visualize the problem, Figure 13-1 represents a probability distribution of returns envisaged by investors. The Comparable Earnings standard attempts to measure the expected book return, that is, the mean of the probability distribution. But the actual realized return in any given time period represents but a single outcome on the distribution, which may be far removed from original investor expectations. The problem is not unique to the Comparable Earnings method. Any method that relies on historical data is vulnerable to this deficiency. To maximize the possibility that historical results will match expectations, the sample of companies studied should be large enough so that deviations from the mean return will cancel out. But such deviations will only cancel out if there are no systematic economy-wide effects acting upon all companies at the same time, such as recession or expansion cycles. The remedy is to average actual book returns over at least a full business cycle.

One practical difficulty with Comparable Earnings is the lag in the availability of reported accounting data. Frequently, the most recent accounting data available are already one year old, notwithstanding the fact that rates will not become effective until an even later date. A remedy does exist, however. An estimate of the current year's ROE and of next year's expected ROE can be derived from analysts' earnings forecasts. The consensus earnings forecasts from IBES or Zacks for a given company can be divided by an estimate of the per share book value of common equity to obtain a forward-looking ROE.

The estimated per share book value of common equity is equal to the previous year's book value per share plus the projected addition to retained earnings. The latter is simply the projected earnings per share for the coming year less the projected dividends per share. Therefore, it is possible to devise projected Comparable Earnings results and circumvent the tardiness of accounting data.

Real Comparable Earnings

Under the "real comparable earnings" approach, the adequacy of unregulated companies' current book returns is examined in relation to varying inflationary environments. For example, suppose that a given utility has the same degree of risk as the average stock market investment. The Standard & Poor's 400 Industrials Index provides a ready-made comparable risk group of companies. If, from 1997–2006, the book equity returns of the S&P 400 averaged 13%, and the rate of inflation over the corresponding period was 4%, then annual real return must have averaged 9%. If the current or forecast inflation rate is 3%, an average prospective return on book equity for the S&P 400 index of 9% + 3% = 12% would be required to maintain a real return comparable to past experience.

Inflation accounting remains a controversial topic. The relationship between comparable earnings and inflation is tenuous. To assess real returns, that is, inflation-adjusted ROEs, one must work with formal inflation-adjusted financial statements where reported earnings and equity book values are adjusted for inventory profits, replacement cost depreciation, and the monetary gains of debt financing. Holland and Myers (1979) studied the real returns of U.S. corporations using the national income accounts. They found that the complexity and data requirements involved in deriving and applying inflation-adjusted returns are probably not worth the practical benefits. Inflation accounting or current cost accounting concepts are not yet officially recognized or used. More importantly, accounting rates of return possess conceptual blemishes that far outweigh any of the benefits of applying formal inflation adjustments.

In times of variable inflation, it is obvious that accounting rates of return are not accurate measures of true economic rates of return. What is less obvious is that accounting returns are generally not valid measures of economic returns even under non-inflationary conditions. Accounting or book return is, in many cases, a poor measure of true economic return. The relationship between the two rates is a complex function of the age structure of a firm's assets, the company's growth, depreciation policy, and inflation. To illustrate, the book return of a utility with aged assets will exceed that of a company with relatively new assets, all else remaining constant.[2]

Several academic studies, notably by Solomon (1970), Solomon and Laya (1967), and Fisher and McGowan (1983), have confirmed that the strong disparity between accounting and true economic return and the biases inherent in book returns are systematic and do not cancel out in the averaging process. It was suggested earlier that the reference group of companies be made up of unregulated companies in order to avoid the circularity problem. But, given that rates are set on the basis of a book value rate base in most jurisdictions, the economic value of a utility is likely to be in closer concordance with its book value. Thus, the biases in book returns of unregulated firms are inherently more serious than the biases for regulated firms.

Risk Adjustment

The risk comparability of the two groups can be verified by comparing the summary risk statistics of the utility group and the industrials group. Typically, if the risk filter is constructed correctly, no adjustment to the comparable earnings result is necessary for any risk differential between utilities and the industrial group. If the risk filter is valid, the industrial group will be, by definition, virtually identical to the utility group.

If risk differences between the utility and the unregulated group do exist, perhaps because of the scarcity of low-risk industrial companies and/or because of liberal screening criteria, a risk adjustment may be in order. There are several ways to quantify the risk adjustment. One way is to compare the average beta of the two groups and use the CAPM to quantify the return differences implied by the differences in the betas between the two groups. For example, if the difference in beta between the utility group and the industrials group is 0.05, the return differential is given by 0.05 times the excess return on the market, $(R_M - R_F)$. Using an estimate of 6% for $(R_M - R_F)$, the return adjustment is 30 basis points. Assuming the industrial group has the higher average beta, the Comparable Earnings result is therefore adjusted downward by 30 basis points.

Another method is to estimate the DCF cost of equity implied by the relative price/earnings (P/E) ratios of the two groups. Because P/E ratio differences between the two groups are due to differences in growth and risk, and because growth differentials can be factored out, the difference in DCF cost of equity

[2] See Brealey, Myers, Allen (2006) Chapter 12 for an excellent discussion of economic vs accounting returns. See also Bodie (1982).

reflects the difference in risk. The following DCF formula using the dividend payout, D/E , reconciles the cost of common equity with the observed P/E ratio[3] and takes growth differentials into account:

$$K = \frac{D/E}{P/E} + g \qquad (13\text{-}1)$$

The DCF return for each group can be calculated using the above formula. The return differential between the two groups will determine the magnitude of the adjustment to the industrial returns.

A third method is based on market-to-book (M/B) ratios. If the average M/B ratio for the group of comparable-risk companies is reasonably close to 1.0, if there is no inflation, and if the standard DCF model is applicable to the companies in the group, then the sample companies are earning their cost of capital. This is because in an inflation-free, competitive environment, firm market values are driven to book values. If the average M/B ratio exceeds 1.0, the industrial group may be suspected of earning monopolistic returns in excess of the cost of capital, and the group's average book return is not an adequate measure of cost of capital. One way to circumvent this problem is to eliminate from the sample those industries that are characterized by high concentrations of market share.

This argument is valid only if actual realized book returns are, in fact, reflective of expected book returns and if inflation is absent. In the absence of inflation, if realized book returns averaged over a long time period for a large aggregate of comparable-risk companies are taken as valid surrogates for expected book returns, then it is appropriate to compute M/B ratios in order to gauge whether these companies are expected to earn an amount more, less, or equal to their cost of capital. To maximize the possibility that the average book returns of the reference companies are in fact reflective of their cost of capital, a specified M/B ratio constraint can be applied on the sample companies as an additional screening criterion.

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[3] The following equation transforms the observed P/E ratio into the investor's required return on equity. From the formal DCF statement of the value of a share of common stock, from Chapter 8, Equation 8-7:

$$P = D_1/(K - g)$$

but $D_1 = E_1(1 - b)$. Substituting and dividing both sides by E:

$$P/E = (1 - b)/(K - g)$$

Dividing both sides of the equation by P/E and solving for K:

$$K = (1 - b)/P/E + g$$

But the payout ratio, $(1 - b)$, equals D/E. So, $K = D/E \,/\, P/E + g$

The picture changes when inflation is introduced. For unregulated firms, the natural forces of competition will ensure over the long run that the ratio of the market value of these firms' securities equals the replacement cost of their assets, and not their book value. As discussed in Chapter 12, this suggests that a fair and reasonable price for a public utility's common stock is one that produces equality between the market price of its common equity and the replacement cost of its physical assets. The latter circumstance will not necessarily occur when the M/B ratio is 1.0. Therefore, an M/B in excess of 1.0 is not necessarily indicative of monopoly returns.

The appropriate manner of testing for the existence of monopoly profits is therefore to determine the Q-ratio of the industrial firms. If the Q-ratio exceeds 1.0, excess returns are indicated, and vice versa. If the Q-ratio is reasonably close to 1.0, the firms in the comparable group are indeed competitive and earning fair returns equal to the cost of capital. McShane (2005) suggests an expedient technique for computing the Q-ratio. Because reliable replacement cost data are unavailable for industrial firms, the common equity is repriced by adding annual increments to book value to reflect cumulative inflation, using the Consumer Price Index of Gross Domestic Product Deflator. The market value of the equity is then compared to its restated book value to determine if the Q-ratio differs significantly from 1.0. In the absence of any evidence of monopolistic returns, no adjustment to the industrial returns is warranted due to high M/B ratios. If the Q-ratio departs significantly from 1.0, a return adjustment is required.

Some Comparable Earnings enthusiasts argue that the achieved ROEs can be used to determine the cost of capital, and to that end, they adjust the industrial ROEs to a value that would produce an M/B ratio of 1.0. In other words, these analysts take the position that because current M/B ratios are in excess of 1.0, this indicates that companies are expected by investors to be able to earn more than their cost of capital, and that the regulating authority should lower the authorized return on equity, so that the stock price will decline to book value. Chapter 12 offered several reasons why this view of the role of M/B ratios in regulation should be avoided. The fundamental goal of regulation should be to set the expected economic profit for a public utility equal to the level of profits expected to be earned by firms of comparable risk, in short, to emulate the competitive result.

Case Study 13-1

In this case study drawn from an actual rate case, a sample of comparable-risk industrials and public utilities was composed using four risk measures as screening guides. Only those companies whose risk and variability characteristics were at the low end of the risk spectrum survived the stringent screening process. The first risk measure was the beta coefficient, a market-oriented measure. The second, third, and fourth risk measures, which are accounting-oriented, were the standard deviation of achieved book returns on equity (STDROE), the coefficient of variation of book equity returns (CVROE), and total interest coverage. The book equity returns in the last 10 years were averaged for each company. Both the STDROE and the CVROE were then computed for each company. The CVROE was obtained by dividing the STDROE by the mean.

The interest coverage ratio measures the ability of a firm's earnings to meet its fixed obligations, and is an important determinant of creditworthiness scrutinized by bond rating agencies and by the investment community. Total interest coverage figures were obtained from Standard & Poor's Research Insight database.[4]

The initial screening process to derive the sample of comparable-risk, publicly traded industrial and utility companies evolved as follows:

(1) Companies listed in The Value Line Investment Survey and for which information was available on Standard & Poor's Research Insight database yielded an initial sample of 1,475 companies.

(2) Companies that did not have current year interest coverage data and companies with negative interest coverage were omitted from the sample, reducing the sample size to 1,352.

(3) Companies that did not have ROE data for each of the last 10 years and companies with negative mean ROEs were omitted from the sample, reducing the sample size to 967.

(4) Companies with STDROE greater than 100 and CVROE greater than 10 were deleted from the sample, leaving a total of 953 companies ready to be screened.

(5) Finally, to simulate the coverage environment of the utility industry, companies with total interest coverage of less than 1.00 and greater than 4.00 were eliminated from the sample, leaving a total sample of 551 companies.

[4] The definition of total interest coverage is "income before extraordinary items" (the income of a company after all expenses, but before provisions for common and/or preferred dividends), plus "interest expense" (the periodic expense to the company of securing short- and long-term debt).

The companies were then further screened as follows. The average beta and total interest coverage of the sample of 551 companies were 0.97 and 2.20, respectively. The third and fourth risk measures yielded an average STDROE and CVROE for the sample of 6.45 and 0.7744, respectively. All companies with market risk and total interest coverage less than or equal to the average and whose STDROE and CVROE measures of risk were less than or equal to half the average were retained, that is, companies with a beta less than or equal to 0.97, total interest coverage less than or equal to 2.20, STDROE less than or equal to 3.22 and CVROE less than or equal to 0.3872.

Table 13-1 shows the list of companies and the summary statistics for the 46 companies that survived the screens. It is interesting to note that several utilities appear in the surviving sample, attesting to its comparability, reasonableness, and accuracy. Of the 46 surviving companies, 18 are industrials and 28 are utilities, 8 of which are gas distribution companies.

Table 13-2 shows the summary statistics for the 18 industrials that survived the stringent screening process. The group of 18 comparable-risk companies experienced a mean return on book equity of 13.13% over the last 10 years. As indicated at the bottom of the various columns, the average adjusted beta for this sample of low-risk industrials is 0.84. The average total interest coverage is 1.41, the average CVROE is 0.1588, and the average STDROE is 1.80. To place the results for the industrial group in perspective, the statistics for the entire screened database of 551 companies were the following: average beta = 0.97, average total interest coverage = 2.20, average CVROE = 0.7744, and average STDROE = 6.45.

Another way of constructing the screen is to rank the companies on each of the risk criteria, and then array the companies by their composite ordinal risk score, as illustrated in Chapter 14, Table 14-3.

13.3 Assessment

On the plus side of the ledger, the Comparable Earnings standard is easy to calculate relative to the market-based techniques (DCF, CAPM, etc), and the amount of subjective judgment required is minimal. The method avoids several of the subjective factors involved in other cost of capital methodologies. For example, the DCF approach requires the determination of the growth rate contemplated by investors, which is a subjective factor. The CAPM requires the specification of several expectational variables, such as market return and beta. In contrast, the Comparable Earnings approach makes use of simple, readily available accounting data. Return on book equity data are widely

TABLE 13-1
AVERAGE RETURN ON EQUITY AND RISK MEASURES

Company	Status	10-Year Mean ROE	STDROE	CVROE	Beta	Interest Cover
1 Amer. Elec Pwr	R	12.71	1.21	0.0954	0.75	2.16
2 Amer. Water Wks	R	12.77	1.55	0.1211	0.65	1.70
3 Ameron, Inc.	U	8.12	2.14	0.2635	0.50	1.50
4 Amsouth Bancorp	U	14.03	1.49	0.1063	0.90	1.34
5 Atlanta Gas Lt	R	12.52	1.69	0.1352	0.65	2.12
6 BCE Inc.	R	12.55	1.56	0.1245	0.60	1.67
7 Boatmen's Bncsh	U	13.68	2.78	0.2033	0.95	1.30
8 Calif Water	R	13.55	1.68	0.1236	0.50	2.05
9 Canon Inc (ADR)	U	8.52	3.18	0.3728	0.75	1.68
10 Commerce Bancsh	U	12.68	1.15	0.0911	0.75	1.35
11 Conn. Energy	R	11.60	1.34	0.1156	0.55	1.89
12 Conn. Nat Gas	R	13.14	1.38	0.1052	0.60	2.11
13 Consumers Water	R	13.82	2.91	0.2107	0.50	1.70
14 Fifth Third Bnc	U	17.38	0.82	0.0470	0.95	1.55
15 First Alabama	U	14.43	0.82	0.0569	0.95	1.42
16 First of Amer.	U	15.45	1.16	0.0753	0.95	1.23
17 First Tenn Natl	U	13.79	2.79	0.2020	0.85	1.32
18 Hawaiian Elec.	R	12.24	1.77	0.1445	0.70	1.42
19 Hitachi, Ltd.	U	8.25	3.09	0.3740	0.75	1.68
20 Houston Inds.	R	12.96	2.27	0.1750	0.60	1.91
21 Huntington Banc	U	13.89	2.55	0.1838	0.90	1.34
22 Idaho Power	R	11.30	2.86	0.2533	0.60	2.08
23 IES Industries	R	12.36	2.89	0.2339	0.55	2.11
24 Interstate Pwr	R	10.87	2.32	0.2136	0.55	2.14
25 Liberty Nat'l	U	14.07	0.86	0.0612	0.85	1.30
26 Marshall&Ilsley	U	15.57	1.33	0.0856	0.95	1.52
27 Nat'l Fuel Gas	R	11.82	2.24	0.1896	0.60	2.00
28 Northeast Util	R	14.41	2.91	0.2020	0.65	2.06
29 NW Natural Gas	R	10.98	2.84	0.2589	0.60	1.59
30 Ohio Edison	R	12.50	2.78	0.2222	0.80	1.98
31 Old Kent Fin'l	U	15.98	1.25	0.0785	0.90	1.37
32 Oneok Inc.	R	8.78	2.70	0.3077	0.80	1.90
33 Phila. Suburban	R	10.88	0.75	0.0686	0.60	1.71
34 Public Svc (CO)	R	13.33	1.72	0.1291	0.65	2.09
35 Public Svc Ent.	R	12.77	1.36	0.1061	0.70	2.02
36 Sierra Pacific	R	11.13	1.68	0.1513	0.55	1.80
37 Sony Corp.(ADR)	U	8.49	3.12	0.3675	0.75	1.40
38 South Jersey IN	R	11.63	1.49	0.1278	0.50	1.95
39 Star Banc Corp.	U	13.41	0.62	0.0463	0.85	1.33
40 Synovus Fin'l	U	17.37	1.33	0.0767	0.65	1.32
41 Textron, Inc.	U	11.18	1.86	0.1663	0.95	1.44
42 United Water	R	11.97	1.88	0.1570	0.70	1.63
43 Utilicorp Untd.	R	13.35	3.05	0.2283	0.60	1.53
44 Washington Ener	R	9.56	3.07	0.3208	0.55	1.45
45 Westc'st Energy	R	9.95	1.52	0.1529	0.50	1.46
46 Wicor, Inc.	R	11.61	3.18	0.2736	0.60	2.14
Average		**12.46**	**1.98**	**0.1697**	**0.70**	**1.69**

Source: S&P Research Insight and Value Line Investment Analyzer

TABLE 13-2
AVERAGE RETURN ON EQUITY AND RISK MEASURES

Company	Status	10-Year Mean ROE	STDROE	CVROE	Beta	Interest Cover
1 Ameron, Inc.	U	8.12	2.14	0.2635	0.50	1.50
2 Amsouth Bancorp	U	14.03	1.49	0.1063	0.90	1.34
3 Boatmen's Bncsh	U	13.68	2.78	0.2033	0.95	1.30
4 Canon Inc (ADR)	U	8.52	3.18	0.3728	0.75	1.68
5 Commerce Bancsh	U	12.68	1.15	0.0911	0.75	1.35
6 Fifth Third Bnc	U	17.38	0.82	0.0470	0.95	1.55
7 First Alabama	U	14.43	0.82	0.0569	0.95	1.42
8 First of Amer.	U	15.45	1.16	0.0753	0.95	1.23
9 First Tenn Natl	U	13.79	2.79	0.2020	0.85	1.32
10 Hitachi, Ltd.	U	8.25	3.09	0.3740	0.75	1.68
11 Huntington Banc	U	13.89	2.55	0.1838	0.90	1.34
12 Liberty Nat'l	U	14.07	0.86	0.0612	0.85	1.30
13 Marshall&Ilsley	U	15.57	1.33	0.0856	0.95	1.52
14 Old Kent Fin'l	U	15.98	1.25	0.0785	0.90	1.37
15 Sony Corp.(ADR)	U	8.49	3.12	0.3675	0.75	1.40
16 Star Banc Corp.	U	13.41	0.62	0.0463	0.85	1.33
17 Synovus Fin'l	U	17.37	1.33	0.0767	0.65	1.32
18 Textron, Inc.	U	11.18	1.86	0.1663	0.95	1.44
Average		**13.13**	**1.80**	**0.1588**	**0.84**	**1.41**

available on computerized data bases for most public companies and for a wide variety of market indices.

The method is easily understood, and is firmly anchored in regulatory tradition. The method is not influenced by the regulatory process to the same extent as market-based methods, such as DCF and CAPM. The return estimate from the Comparable Earnings standard is applied to the utility's book common equity, in contrast to the return estimate from the market-based techniques which is applied to the stock price. Stock price can be influenced by the actions of regulators and investor expectations of those actions. The utility's book common equity on the other hand is much less vulnerable to regulatory influences than stock price.

Although the analyst possesses a fair amount of latitude in selecting risk criteria to define the sample of comparable-risk companies, it is easier to generate a set of comparable-risk companies than it is to measure accurately the input quantities required in alternate cost of capital estimating techniques, such as DCF and CAPM. As a practical matter, although different risk measures may produce different groups of comparable companies, many of the same companies are selected over a wide range of risk measures.

Another positive attribute of the method is that it avoids the problem of overstating or understating investor return requirements when prices and book values are materially different from unity. Use of the comparable earnings method eliminates the problem of material differences in price and book value.

On the minus side of the ledger, the Comparable Earnings approach rests on a particular notion of opportunity cost, namely that a utility should be allowed to earn what it would have earned had its capital been invested in other firms of comparable risk. A goal of fairness is said to be achieved by this. This particular interpretation of returns stands in contrast to financial theory, which interprets returns as forward-looking, market-determined returns. Accounting rates of return are not opportunity costs in the economic sense, but reflect the average returns earned on past investments, and hence reflect past regulatory actions. The denominator of accounting return, book equity, is a historical cost-based concept, which is insensitive to changes in investor return requirements. Only stock market price is sensitive to a change in investor requirements. Investors can only purchase new shares of common stock at current market prices and not at book value.

More simply, the Comparable Earnings standard ignores capital markets. If interest rates go up 2% for example, investor requirements and the cost of equity should increase commensurably, but if regulation is based on accounting returns, no immediate change in equity cost results. Investors capitalize expected future cash flows and not current earnings, and what was earned on book value is not directly related to current market rates.

Another conceptual anomaly is that when the utility's current book rate of return is compared to that of firms of comparable risk, it is assumed that there is a fundamental theoretical relationship between accounting returns and risk. But no such relationship exists in financial theory. The risk-return tradeoff found in financial theory is expressed in terms of market values rather than in terms of accounting values. Only if long time periods are examined and broad aggregates are used can an empirical relationship between risk and accounting return be found.

Another blemish of the Comparable Earnings method is that comparisons of book rates of return among companies are computationally misleading because of differences among companies in their accounting procedures. Despite the umbrella of generally acceptable accounting principles, areas of difference include the treatment of inventory valuation, depreciation, investment tax credits, deferred taxes, and extraordinary items. The lack of accounting homogeneity is exacerbated by the necessity of studying nonregulated companies, which are likely to exhibit greater accounting differences. As a practical matter, such differences are relatively minor in comparison to the problems of risk estimation and time period discussed earlier, and may be attenuated by employing reasonably diverse aggregates in the reference group and by excluding groups with vastly different asset and financing compositions from utilities, such as financial institutions and natural resource companies. If the companies in a particular reference group have clear identifiable differences in accounting treatment, the latter should be used as an additional screening criterion to eliminate such companies, or the accounting rates of return should be restated on a consistent comparable basis.

More fundamentally, the basic premise of the Comparable Earnings approach is that regulation should emulate the competitive result. It is not clear from this premise which is the proper level of competition being referenced. Is the norm the perfect competition model of economics where no monopolistic elements exist, or is it the degree of competition actually prevailing in the economy? A strong case for the latter can be made on grounds of fairness alone.

Although the Comparable Earnings test does not square well with economic theory, the approach is nevertheless meritorious. If the basic purpose of comparable earnings is to set a fair return rather than determine the true economic return, then the argument is academic. If regulators consider a fair return as one that equals the book rates of return earned by comparable-risk firms rather than one that is equal to the cost of capital of such firms, the Comparable Earnings test is relevant. This notion of fairness, rooted in the traditional legalistic interpretation of the *Hope* language, validates the Comparable Earnings test.

Moreover, if regulation is a substitute for competition, and if the cost of capital is to play the same role in the utility industry as in unregulated industries, then the allowed rate of return should be set in excess of the cost of capital. The reason has to do with the economic criterion employed by corporations in their investment decisions. This criterion is that the expected marginal return on new projects be greater than the cost of capital. Corporations rank investment projects in descending order of profitability, and successively adopt all investment projects to the point where the least attractive project has a return equal to the cost of capital. The average return on all new investment projects will then exceed the cost of capital. If the average, rather than the marginal, return is set equal to the cost of capital as is the case with Comparable Earnings, the implication is that a company also accepts investment projects that are less profitable than the cost of capital, so that the average return on all projects accepted is equal to the cost of capital. Corporate investment would largely cease under such a scheme. Moreover, if unregulated companies were to pursue such an investment policy, a serious misallocation of economic resources would ensue.

The Comparable Earnings approach is far more meaningful in the regulatory arena than in the sphere of competitive firms. Unlike industrial companies, the earnings requirement of utilities is determined by applying a percentage rate of return to the book value of a utility's investment, and not on the market value of that investment. Therefore, it stands to reason that a different percentage rate of return than the market cost of capital be applied when the investment base is stated in book value terms rather than market value terms. In a competitive market, investment decisions are taken on the basis of market prices, market values, and market cost of capital. If regulation's role was to duplicate the competitive result perfectly, then the market cost of capital would be applied to the current market value of rate base assets employed by utilities to provide service. But because the investment base for ratemaking purposes is expressed in book value terms, a rate of return on book value, as is the case with Comparable Earnings, is highly meaningful.

References

Bodie, Z. "Compouund Interest Depreciation in Capital Investments." *Harvard Business Review*, 60, May–June 1982.

Brealey, R., Myers, S., and Allen, P. *Principles of Corporate Finance,* 8th ed. New York: McGraw-Hill, 2006.

Fisher, F.M. and McGowan, J.J. "On the Misuse of Accounting Rates of Return to Infer Monopoly Profits." *American Economic Review,* March 1983, 82–97.

Holland, D.M and Myers, S.C. "Trends in Corporate Profitability and Capital Costs." In *The Nation's Capital Needs: Three Studies,* Edited by R. Lindsay, Committee for Economic Development, 1979.

McShane, K.C. Prepared Testimony on Fair Return on Equity for Hydro-Quebec, Foster Associates, Inc., 2005.

Morin, R.A. Prepared Testimony on Fair Return on Equity for TransEnergie Hydro-Quebec, Utility Research International, 2004.

Parcell, D.C. "*The Cost of Capital—A Practitioner's Guide*," Prepared for the Society of Utility and Regulatory Financial Analysts, 1997.

Solomon, E. "Alternative Rate of Return Concepts and Their Implications for Utility Regulation." *Bell Journal of Economics and Management Science,* Spring 1970, 65–81.

Solomon, E. and Laya, J.E. "Measurement of Company Profitability: Some Systematic Errors in the Accounting Rate of Return." In *Financial Research and Management Decisions,* Edited by A.A. Robichek. New York: Wiley and Sons, 1967.

Quarter-End Insights

Stock Market Outlook: Proceed With Caution

By Matthew Coffina, CFA | 03-30-15 | 06:00 AM | Email Article

- All eyes remain on the Federal Reserve as it moves closer to raising short-term interest rates. However, we think investors are paying too much attention to the exact timing of a rate increase, while ignoring the far more important question of where rates will ultimately settle.
- We've adjusted our cost of capital methodology to better reflect realistic long-term inflation and total return expectations. Our fair value estimates assume a long-term Treasury yield of 4.5%--well above current interest rates.
- A comprehensive review of our energy sector coverage revealed that we were too optimistic about long-run oil and gas prices. The energy sector still seems relatively undervalued, but fair value estimates have been coming down.
- The broader market looks moderately overvalued, and opportunities are few and far between. Investors in common stocks must have a long time horizon and the patience and discipline to ride out volatility.

Interest Rates: Gravity for Asset Prices

Investors always hang on the Federal Reserve's every word, but the obsession with monetary policy is reaching new heights as we approach the first short-term rate hike in almost a decade. The target federal funds rate has been around zero since late 2008, and the last time the United States was in an environment of tightening monetary policy was mid-2006. Throw in the Fed's quantitative easing program and other unconventional policy actions around the world, and it's clear that we're in uncharted territory. It's no wonder investors are on edge.

Warren Buffett has compared interest rates to gravity for asset prices. The intrinsic value of any financial asset is equal to the discounted present value of the cash flows it will produce. Higher interest rates mean higher discount rates, and thus lower present value. In other words, $1 received 10 years from now will be worth less today if we could have invested it at 4% in the meantime as opposed to 2%. The discount rate for bonds is observable in the market as the yield to maturity. The discount rate for stocks can't be observed directly, but that doesn't mean it's any less real.

The complication with stocks--as opposed to bonds--is that future cash flows are also unknown. To the extent that higher interest rates are correlated with strong economic growth or higher inflation, it's reasonable to expect that companies' cash flows will also be higher. For investors with a sufficiently long time horizon (at least five years, and preferably decades), we still think stocks are far superior to bonds in terms of their ability to protect and grow purchasing power.

Considering that most investors are focused on the threat of rising interest rates, it may be surprising that Morningstar has recently been reducing our cost of equity assumptions (a key input to discount rates). The timing here is purely coincidental. In examining market history, we concluded that real (inflation-adjusted) returns from stocks have averaged around 6.5%-7.0% per year. We expect long-run inflation in the range of 2.0%-2.5%.

The midpoint of both ranges leads us to a nominal return expectation for the overall stock market of 9%--down from our previous assumption of 10%. We use this 9% cost of equity to discount free cash flows to shareholders of developed-markets companies with average economic sensitivity. We use a cost of equity of 7.5% (down from 8%) for companies with below-average economic sensitivity, and costs of equity of 11% (down from 12%) or 13.5% (down from 14%) for companies with above-average economic sensitivity. We make adjustments for firms operating in foreign jurisdictions with different inflation rates.

Our new cost of equity methodology has resulted in modest fair value increases for a wide variety of stocks. However, this does not mean that we expect the current low interest-rate environment to last indefinitely. Quite the contrary: Our assumptions imply a long-term Treasury yield of 4.5%--well above current interest rates. The 4.5% nominal risk-free rate includes 2.0%-2.5% inflation plus a 2.0%-2.5% real return expectation. We think this is a reasonable base case, and long-term interest rates would need to climb meaningfully above 4.5% before they would be a drag on our fair value estimates (assuming our cash flow forecasts are correct).

Lowering Our Oil and Gas Price Forecasts
Aside from cost of capital changes, the biggest adjustments we've been making to our fair value estimates are in the energy sector. Morningstar's energy team conducted a comprehensive review of the supply and demand outlook for energy over the next five years and concluded that our previous oil and gas price assumptions were too optimistic. We now use a long-term Brent crude oil price of $75 per barrel (down from $100) and a Henry Hub natural gas price of $4 per thousand cubic feet (down from $5.40). This has resulted in fair value reductions for a broad selection of energy companies, with a few moat downgrades to boot.

Since peaking last summer, oil and gas prices have experienced dramatic declines. Unfortunately, it took us much too long to recognize the fundamental deterioration in the balance between supply and demand underlying the collapse in prices. We've implemented a new modeling framework that we hope will enable us to be more proactive in the future. Our latest analysis led to three important revelations:

1. Growth in U.S. shale oil production has pushed the highest-cost resources off the global oil supply curve. If oil sands mining and marginal deep-water projects aren't needed to meet incremental oil demand over the next five years, they lose their relevance to setting oil prices. We expect higher-quality deep-water projects to provide the marginal barrel in the near term, leading to a Brent midcycle price of $75/barrel.
2. Our new forecasts also account for falling oilfield-services pricing due to overcapacity. Energy companies are aggressively cutting their capital spending budgets, creating an excess supply of rigs, equipment, and labor. Far from being static, marginal costs fluctuate with changing input costs.

3. The domestic natural gas market remains well-supplied with low-cost shale gas, especially from the Marcellus Shale. Improvements in drilling efficiency and abundant resources should enable producers to easily meet growing demand, even at a midcycle natural gas price of $4/mcf.

Smaller, less diversified, and more leveraged exploration and production companies have seen the biggest fair value reductions as a result of our new commodity price forecasts. Oilfield services and integrated oil companies have also been hit. In contrast, our fair value estimates for midstream energy companies have proven resilient: These firms are more exposed to volumes than prices, and benefit from an environment of plentiful supply. Our analysts still view energy as the most undervalued sector, but the gap has narrowed significantly as our fair value estimates have come down.

Market's Rise Leaves Few Opportunities
As for the valuation of the broader stock market, the median stock in Morningstar's coverage was trading 4% above our fair value estimate as of the close on March 20, 2015. Cyclical and defensive sectors have been taking turns leading the market higher, which has left both overvalued. In our view, industrials, technology, health care, consumer defensive, and utilities are the most overvalued sectors, with the median stock in each trading between 7% and 11% above our fair value estimates. Only energy looks like a relative bargain, with the median stock trading 9% below our fair value estimate.

Things don't look much better at the level of individual stocks. Only 25 stocks under Morningstar's coverage carry our 5-star rating, and many of these are high-risk mining, energy, and emerging-markets companies. Only 14 are traded on U.S. exchanges. Only one 5-star stock (Spectra Energy (SE)) has a wide economic moat.

The S&P 500--at a level of 2,108--carries a Shiller price/earnings ratio of 27.7--higher than 79% of monthly readings since 1989. The Shiller P/E uses a 10-year average of inflation-adjusted earnings in the denominator. Alternatively, the S&P 500 is trading at 18.4 times trailing peak operating earnings, which is higher than 77% of monthly readings since 1989. In both cases, such high valuation levels have historically been associated with poor subsequent five-year total returns and an elevated risk of a material drawdown. Proceed with caution.

More Quarter-End Insights

- **Economic Outlook**: More Slow Growth but Labor Scarcity
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- Consumer Cyclical Investors: Shop Carefully in 2015
- Consumer Defensive: Attractive Companies, Top-Shelf Valuations
- Energy: Coping With Lower Oil and Gas Prices
- Financial Services: Bank Worries Are Overdone
- Health Care: 3 Picks in a More Expensive Sector

- Industrials: A Few Bargains Still Remaining
- Real Estate: REITs That Can Weather a Rising Rate Environment
- Tech and Telecom Sectors: Time to Be Selective
- Utilities: Bloody February Brings Valuations Back In Line

Matt Coffina, CFA, is editor of Morningstar® StockInvestorSM.

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Morningstar Market Assumptions

Morningstar uses three sets of default Market Assumptions: Basic, Consolidated and Expanded. The tables below show you the asset classes in each set, plus the Expected Return, Standard Deviation and Yield for each asset cl
This information is updated annually and is provided by Ibbotson Associates. The information is based on returns since 1926 for equities and 1970 for bonds..

Morningstar Basic

Asset Class	Expected Return	Standard Deviation	Yield
US Large Cap Growth	6.03	17.05	1.91
US Large Cap Value	7.89	15.44	2.80
US Mid Cap Growth	7.93	21.65	1.15
US Mid Cap Value	10.09	16.60	2.48
US Small Cap Growth	6.81	23.29	0.70
US Small Cap Value	10.86	18.90	2.19
Non-US Dev Stk	8.67	17.43	3.27
Non-US Emrg Stk	11.87	28.73	2.78
US Inv Grade Bonds	3.60	6.05	4.05
US High Yield Bonds	6.58	9.61	9.48
Non-US Dev Bonds	3.44	9.40	2.73
Cash	1.94	1.89	2.04
Real Estate	7.60	23.12	4.20
Commodities	4.47	27.25	2.04
Inflation	2.25	1.72	0.00

Morningstar Consolidated

Asset Class	Expected Return	Standard Deviation	Yield
US Large Cap	7.41	15.59	2.20
US Mid/Small Cap	8.68	20.44	1.45
Non-US Stock	8.67	17.43	3.27
Bonds	3.60	6.05	4.05
Cash	1.94	1.89	2.04
Real Estate	7.60	23.12	4.20
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Morningstar Expanded

Asset Class	Expected Return	Standard Deviation	Yield
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Non-US Dev Stk	8.67	17.43	3.27
Non-US Emrg Stk	11.87	28.73	2.78
US Txbl Long Term Bonds	4.63	15.27	5.12
US Txbl Int Term Bonds	3.50	5.31	3.66
US Txbl Short Term Bonds	2.84	2.32	2.80
US Infl Protected Bonds	3.94	9.79	1.80
US Tax-Exempt Bonds	2.64	6.15	3.52
US High Yield Bonds	6.58	9.61	9.48
Non-US Dev Bonds	3.44	9.40	2.73
Non-US Emrg Bonds	6.00	10.78	7.24
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Mr. Buffett on the Stock Market

Fortune, 11/22/99

The most celebrated of investors says stocks can't possibly meet the public's expectations. As for the Internet? He notes how few people got rich from two other transforming industries, auto and aviation.

> Warren Buffett, chairman of Berkshire Hathaway, almost never talks publicly about the general level of stock prices--neither in his famed annual report nor at Berkshire's thronged annual meetings nor in the rare speeches he gives. But in the past few months, on four occasions, Buffett did step up to that subject, laying out his opinions, in ways both analytical and creative, about the long-term future for stocks. FORTUNE's Carol Loomis heard the last of those talks, given in September to a group of Buffett's friends (of whom she is one), and also watched a videotape of the first speech, given in July at Allen & Co.'s Sun Valley, Idaho, bash for business leaders. From those extemporaneous talks (the first made with the Dow Jones industrial average at 11,194), Loomis distilled the following account of what Buffett said. Buffett reviewed it and weighed in with some clarifications.

Investors in stocks these days are expecting far too much, and I'm going to explain why. That will inevitably set me to talking about the general stock market, a subject I'm usually unwilling to discuss. But I want to make one thing clear going in: Though I will be talking about the level of the market, I will not be predicting its next moves. At Berkshire we focus almost exclusively on the valuations of individual companies, looking only to a very limited extent at the valuation of the overall market. Even then, valuing the market has nothing to do with where it's going to go next week or next month or next year, a line of thought we never get into. The fact is that markets behave in ways, sometimes for a very long stretch, that are not linked to value. Sooner or later, though, value counts. So what I am going to be saying--assuming it's correct--will have implications for the long-term results to be realized by American stockholders.

Let's start by defining "investing." The definition is simple but often forgotten: Investing is laying out money now to get more money back in the future--more money in real terms, after taking inflation into account.

Now, to get some historical perspective, let's look back at the 34 years before this one--and here we are going to see an almost Biblical kind of symmetry, in the sense of lean years and fat years--to observe what happened in the stock market. Take, to begin with, the first 17 years of the period, from the end of 1964 through 1981. Here's what took place in that interval:

Dow Jones Industrial Average
Dec. 31, 1964: **874.12**
Dec. 31, 1981: **875.00**

Now I'm known as a long-term investor and a patient guy, but that is not my idea of a big move.

And here's a major and very opposite fact: During that same 17 years, the GDP of the U.S.--that is, the business being done in this country--almost quintupled, rising by 370%. Or, if we look at another measure, the sales of the FORTUNE 500 (a changing mix of companies, of course) more than sextupled. And yet the Dow went exactly nowhere.

To understand why that happened, we need first to look at one of the two important variables that affect investment results: interest rates. These act on financial valuations the way gravity acts on matter: The higher the rate, the greater the downward pull. That's because the rates of return that investors need from any kind of investment are directly tied to the risk-free rate that they can earn from government securities. So if the government rate rises, the prices of all other investments must adjust downward, to a level that brings their expected rates of return into line. Conversely, if government interest rates fall, the move pushes the prices of all other investments upward. The basic proposition is this: What an investor should pay today for a dollar to be received tomorrow can only be determined by first looking at the risk-free interest rate.

Consequently, every time the risk-free rate moves by one basis point--by 0.01%--the value of every investment in the country changes. People can see this easily in the case of bonds, whose value is normally affected only by interest rates. In the case of equities or real estate or farms or whatever, other very important variables are almost always at work, and that means the effect of interest rate changes is usually obscured. Nonetheless, the effect--like the invisible pull of gravity--is constantly there.

In the 1964-81 period, there was a tremendous increase in the rates on long-term government bonds, which moved from just over 4% at year-end 1964 to more than 15% by late 1981. That rise in rates had a huge depressing effect on the value of all investments, but the one we noticed, of course, was the price of equities. So there--in that tripling of the gravitational pull of interest rates--lies the major explanation of why tremendous growth in the economy was accompanied by a stock market going nowhere.

Then, in the early 1980s, the situation reversed itself. You will remember Paul Volcker coming in as chairman of the Fed and remember also how unpopular he was. But the heroic things he did--his taking a two-by-four to the economy and breaking the back of inflation--caused the interest rate trend to reverse, with some rather spectacular results. Let's say you put $1 million into the 14% 30-year U.S. bond issued Nov. 16, 1981, and reinvested the coupons. That is, every time you got an interest payment, you used it to buy more of that same bond. At the end of 1998, with long-term governments by then selling at 5%, you would have had $8,181,219 and would have earned an annual return of more than 13%.

That 13% annual return is better than stocks have done in a great many 17-year periods in history--in most 17-year periods, in fact. It was a helluva result, and from none other than a stodgy bond.

The power of interest rates had the effect of pushing up equities as well, though other things that we will get to pushed additionally. And so here's what equities did in that same 17 years: If you'd invested $1 million in the Dow on Nov. 16, 1981, and reinvested all dividends, you'd have had $19,720,112 on Dec. 31, 1998. And your annual return would have been 19%.

The increase in equity values since 1981 beats anything you can find in history. This increase even surpasses what you would have realized if you'd bought stocks in 1932, at their Depression bottom--on its lowest day, July 8, 1932, the Dow closed at 41.22--and held them for 17 years.

The second thing bearing on stock prices during this 17 years was after-tax corporate profits, which the chart, After-Tax Corporate Profits as a Percentage of GDP, displays as a percentage of GDP. In effect, what this chart tells you is what portion of the GDP ended up every year with the shareholders of American business.

The chart, as you will see, starts in 1929. I'm quite fond of 1929, since that's when it all began for me. My dad was a stock salesman at the time, and after the Crash came, in the fall, he was afraid to call anyone--all those people who'd been burned. So he just stayed home in the afternoons. And there wasn't television then. Soooo ... I was conceived on or about Nov. 30, 1929 (and born nine months later, on Aug. 30, 1930), and I've forever had a kind of warm feeling about the Crash.

As you can see, corporate profits as a percentage of GDP peaked in 1929, and then they tanked. The left-hand side of the chart, in fact, is filled with aberrations: not only the Depression but also a wartime profits boom--sedated by the excess-profits tax--and another boom after the war. But from 1951 on, the percentage settled down pretty much to a 4% to 6.5% range.

By 1981, though, the trend was headed toward the bottom of that band, and in 1982 profits tumbled to 3.5%. So at that point investors were looking at two strong negatives: Profits were sub-par and interest rates were sky-high.

And as is so typical, investors projected out into the future what they were seeing. That's their unshakable habit: looking into the rear-view mirror instead of through the windshield. What they were observing, looking backward, made them very discouraged about the country. They were projecting high interest rates, they were projecting low profits, and they were therefore valuing the Dow at a level that was the same as 17 years earlier, even though GDP had nearly quintupled.

Now, what happened in the 17 years beginning with 1982? One thing that didn't happen was comparable growth in GDP: In this second 17-year period, GDP less than tripled. But interest rates began their descent, and after the Volcker effect wore off, profits began to climb--not steadily, but nonetheless with real power. You can see the profit trend in the chart, which shows that by the late 1990s, after-tax profits as a percent of GDP were running close to

6%, which is on the upper part of the "normalcy" band. And at the end of 1998, long-term government interest rates had made their way down to that 5%.

These dramatic changes in the two fundamentals that matter most to investors explain much, though not all, of the more than tenfold rise in equity prices--the Dow went from 875 to 9,181--during this 17-year period. What was at work also, of course, was market psychology. Once a bull market gets under way, and once you reach the point where everybody has made money no matter what system he or she followed, a crowd is attracted into the game that is responding not to interest rates and profits but simply to the fact that it seems a mistake to be out of stocks. In effect, these people superimpose an I-can't-miss-the-party factor on top of the fundamental factors that drive the market. Like Pavlov's dog, these "investors" learn that when the bell rings--in this case, the one that opens the New York Stock Exchange at 9:30 a.m.--they get fed. Through this daily reinforcement, they become convinced that there is a God and that He wants them to get rich.

Today, staring fixedly back at the road they just traveled, most investors have rosy expectations. A Paine Webber and Gallup Organization survey released in July shows that the least experienced investors--those who have invested for less than five years--expect annual returns over the next ten years of 22.6%. Even those who have invested for more than 20 years are expecting 12.9%.

Now, I'd like to argue that we can't come even remotely close to that 12.9%, and make my case by examining the key value-determining factors. Today, if an investor is to achieve juicy profits in the market over ten years or 17 or 20, one or more of three things must happen. I'll delay talking about the last of them for a bit, but here are the first two:

(1) Interest rates must fall further. If government interest rates, now at a level of about 6%, were to fall to 3%, that factor alone would come close to doubling the value of common stocks. Incidentally, if you think interest rates are going to do that--or fall to the 1% that Japan has experienced--you should head for where you can really make a bundle: bond options.

(2) Corporate profitability in relation to GDP must rise. You know, someone once told me that New York has more lawyers than people. I think that's the same fellow who thinks profits will become larger than GDP. When you begin to expect the growth of a component factor to forever outpace that of the aggregate, you get into certain mathematical problems. In my opinion, you have to be wildly optimistic to believe that corporate profits as a percent of GDP can, for any sustained period, hold much above 6%. One thing keeping the percentage down will be competition, which is alive and well. In addition, there's a public-policy point: If corporate investors, in aggregate, are going to eat an ever-growing portion of the American economic pie, some other group will have to settle for a smaller portion. That would justifiably raise political problems--and in my view a major reslicing of the pie just isn't going to happen.

So where do some reasonable assumptions lead us? Let's say that GDP grows at an average 5% a year--3% real growth, which is pretty darn good, plus 2% inflation. If GDP grows at 5%, and you don't have some help from interest rates, the aggregate value of equities is not going to grow a whole lot more. Yes, you can add on a bit of return from dividends. But with stocks selling where they are today, the importance of dividends to total return is way down from what it used to be. Nor can investors expect to score because companies are busy boosting their per-share earnings by buying in their stock. The offset here is that the companies are just about as busy issuing new stock, both through primary offerings and those ever present stock options.

So I come back to my postulation of 5% growth in GDP and remind you that it is a limiting factor in the returns you're going to get: You cannot expect to forever realize a 12% annual increase--much less 22%--in the valuation of American business if its profitability is growing only at 5%. The inescapable fact is that the value of an asset, whatever its character, cannot over the long term grow faster than its earnings do.

Now, maybe you'd like to argue a different case. Fair enough. But give me your assumptions. If you think the American public is going to make 12% a year in stocks, I think you have to say, for example, "Well, that's because I expect GDP to grow at 10% a year, dividends to add two percentage points to returns, and interest rates to stay at a constant level." Or you've got to rearrange these key variables in some other manner. The Tinker Bell approach--clap if you believe--just won't cut it.

Beyond that, you need to remember that future returns are always affected by current valuations and give some thought to what you're getting for your money in the stock market right now. Here are two 1998 figures for the FORTUNE 500. The companies in this universe account for about 75% of the value of all publicly owned American businesses, so when you look at the 500, you're really talking about America Inc.

FORTUNE 500
1998 profits: **$334,335,000,000**
Market value on March 15, 1999: **$9,907,233,000,000**

As we focus on those two numbers, we need to be aware that the profits figure has its quirks. Profits in 1998 included one very unusual item--a $16 billion bookkeeping gain that Ford reported from its spinoff of Associates--and profits also included, as they always do in the 500, the earnings of a few mutual companies, such as State Farm, that do not have a market value. Additionally, one major corporate expense, stock-option compensation costs, is not deducted from profits. On the other hand, the profits figure has been reduced in some cases by write-offs that probably didn't reflect economic reality and could just as well be added back in. But leaving aside these qualifications, investors were saying on March 15 this year that they would pay a hefty $10 trillion for the $334 billion in profits.

Bear in mind--this is a critical fact often ignored--that investors as a whole cannot get anything out of their businesses except what the businesses earn. Sure, you and I can sell each other stocks at higher and higher prices. Let's say the FORTUNE 500 was just one business and that the people in this room each owned a piece of it. In that case, we could sit here and sell each other pieces at ever-ascending prices. You personally might outsmart the next fellow by buying low and selling high. But no money would leave the game when that happened: You'd simply take out what he put in. Meanwhile, the experience of the group wouldn't have been affected a whit, because its fate would still be tied to profits. The absolute most that the owners of a business, in aggregate, can get out of it in the end--between now and Judgment Day--is what that business earns over time.

And there's still another major qualification to be considered. If you and I were trading pieces of our business in this room, we could escape transactional costs because there would be no brokers around to take a bite out of every trade we made. But in the real world investors have a habit of wanting to change chairs, or of at least getting advice as to whether they should, and that costs money--big money. The expenses they bear--I call them frictional costs--are for a wide range of items. There's the market maker's spread, and commissions, and sales loads, and 12b-1 fees, and management fees, and custodial fees, and wrap fees, and even subscriptions to financial publications. And don't brush these expenses off as irrelevancies. If you were evaluating a piece of investment real estate, would you not deduct management costs in figuring your return? Yes, of course--and in exactly the same way, stock market investors who are figuring their returns must face up to the frictional costs they bear.

And what do they come to? My estimate is that investors in American stocks pay out well over $100 billion a year--say, $130 billion--to move around on those chairs or to buy advice as to whether they should! Perhaps $100 billion of that relates to the FORTUNE 500. In other words, investors are dissipating almost a third of everything that the FORTUNE 500 is earning for them--that $334 billion in 1998--by handing it over to various types of chair-changing and chair-advisory "helpers." And when that handoff is completed, the investors who own the 500 are reaping less than a $250 billion return on their $10 trillion investment. In my view, that's slim pickings.

Perhaps by now you're mentally quarreling with my estimate that $100 billion flows to those "helpers." How do they charge thee? Let me count the ways. Start with transaction costs, including commissions, the market maker's take, and the spread on underwritten offerings: With double counting stripped out, there will this year be at least 350 billion shares of stock traded in the U.S., and I would estimate that the transaction cost per share for each side--that is, for both the buyer and the seller--will average 6 cents. That adds up to $42 billion.

Move on to the additional costs: hefty charges for little guys who have wrap accounts; management fees for big guys; and, looming very large, a raft of expenses for the holders of domestic equity mutual funds. These funds now have assets of about $3.5 trillion, and you have to conclude that the annual cost of these to their investors--counting management fees, sales loads, 12b-1 fees, general operating costs--runs to at least 1%, or $35 billion.

And none of the damage I've so far described counts the commissions and spreads on options and futures, or the costs borne by holders of variable annuities, or the myriad other charges that the "helpers" manage to think up. In short, $100 billion of frictional costs for the owners of the FORTUNE 500--which is 1% of the 500's market value--looks to me not only highly defensible as an estimate, but quite possibly on the low side.

It also looks like a horrendous cost. I heard once about a cartoon in which a news commentator says, "There was no trading on the New York Stock Exchange today. Everyone was happy with what they owned." Well, if that were really the case, investors would every year keep around $130 billion in their pockets.

Let me summarize what I've been saying about the stock market: I think it's very hard to come up with a persuasive case that equities will over the next 17 years perform anything like--anything like--they've performed in the past 17. If I had to pick the most probable return, from appreciation and dividends combined, that investors in aggregate--repeat, aggregate--would earn in a world of constant interest rates, 2% inflation, and those ever hurtful frictional costs, it would be 6%. If you strip out the inflation component from this nominal return (which you would need to do however inflation fluctuates), that's 4% in real terms. And if 4% is wrong, I believe that the percentage is just as likely to be less as more.

Let me come back to what I said earlier: that there are three things that might allow investors to realize significant profits in the market going forward. The first was that interest rates might fall, and the second was that corporate profits as a percent of GDP might rise dramatically. I get to the third point now: Perhaps you are an optimist who believes that though investors as a whole may slog along, you yourself will be a winner. That thought might be particularly seductive in these early days of the information revolution (which I wholeheartedly believe in). Just pick the obvious winners, your broker will tell you, and ride the wave.

Well, I thought it would be instructive to go back and look at a couple of industries that transformed this country much earlier in this century: automobiles and aviation. Take automobiles first: I have here one page, out of 70 in total, of car and truck manufacturers that have operated in this country. At one time, there was a Berkshire car and an Omaha car. Naturally I noticed those. But there was also a telephone book of others.

All told, there appear to have been at least 2,000 car makes, in an industry that had an incredible impact on people's lives. If you had foreseen in the early days of cars how this industry would develop, you would have said, "Here is the road to riches." So what did we progress to by the 1990s? After corporate carnage that never let up, we came down to three U.S. car companies--themselves no lollapaloozas for investors. So here is an industry that had an enormous impact on America--and also an enormous impact, though not the anticipated one, on investors.

Sometimes, incidentally, it's much easier in these transforming events to figure out the losers. You could have grasped the importance of the auto when it came along but still found it hard to pick companies that would make you money. But there was one obvious decision you could have made back then--it's better sometimes to turn these things upside down--and that was to short horses. Frankly, I'm disappointed that the Buffett family was not short horses through this entire period. And we really had no excuse: Living in Nebraska, we would have found it super-easy to borrow horses and avoid a "short squeeze."

U.S. Horse Population
1900: **21 million**
1998: **5 million**

The other truly transforming business invention of the first quarter of the century, besides the car, was the airplane--another industry whose plainly brilliant future would have caused investors to salivate. So I went back to check out aircraft manufacturers and found that in the 1919-39 period, there were about 300 companies, only a handful still breathing today. Among the planes made then--we must have been the Silicon Valley of that age--were both the Nebraska and the Omaha, two aircraft that even the most loyal Nebraskan no longer relies upon.

Move on to failures of airlines. Here's a list of 129 airlines that in the past 20 years filed for bankruptcy. Continental was smart enough to make that list twice. As of 1992, in fact--though the picture would have improved since then--the money that had been made since the dawn of aviation by all of this country's airline companies was zero. Absolutely zero.

Sizing all this up, I like to think that if I'd been at Kitty Hawk in 1903 when Orville Wright took off, I would have been farsighted enough, and public-spirited enough--I owed this to future capitalists--to shoot him down. I mean, Karl Marx couldn't have done as much damage to capitalists as Orville did.

I won't dwell on other glamorous businesses that dramatically changed our lives but concurrently failed to deliver rewards to U.S. investors: the manufacture of radios and televisions, for example. But I will draw a lesson from these businesses: The key to investing is not assessing how much an industry is going to affect society, or how much it will grow, but rather determining the competitive advantage of any given company and, above all, the durability of that advantage. The products or services that have wide, sustainable moats around them are the ones that deliver rewards to investors.

This talk of 17-year periods makes me think--incongruously, I admit--of 17-year locusts. What could a current brood of these critters, scheduled to take flight in 2016, expect to encounter? I see them entering a world in which the public is less euphoric about stocks than it is now. Naturally, investors will be feeling disappointment--but only because they started out expecting too much.

Grumpy or not, they will have by then grown considerably wealthier, simply because the American business establishment that they own will have been chugging along, increasing its profits by 3% annually in real terms. Best of all, the rewards from this creation of wealth will have flowed through to Americans in general, who will be enjoying a far higher standard of living than they do today. That wouldn't be a bad world at all--even if it doesn't measure up to what investors got used to in the 17 years just passed.

Bezos on Buffett

Skeptical of Internet mania, the founder and CEO of Amazon.com is spreading the gospel according to Buffett.

Patricia Sellers

Warren Buffett doesn't mention the Internet on these pages. But he does talk about two other transforming industries that failed to reward investors over time: autos and aviation. Only a fool would ignore his implicit warning: A lot of people will lose a lot of money betting on the Internet. Amazon.com founder and CEO Jeff Bezos was so intrigued by Buffett's talk at Herb Allen's gathering of business leaders in Sun Valley, Idaho, last July that he asked Buffett for his lists of the automakers and aircraft manufacturers that didn't make it. "When new industries become phenomenons, a lot of investors bet on the wrong companies," Bezos says. Referring to Buffett's 70-page catalog of mostly dead car and truck makes, he adds, "I noticed that decades ago, it was de rigueur to use 'Motors' in the name, just as everybody uses 'dot-com' today. I thought, Wow, the parallel is interesting."

Especially interesting to a billionaire like Bezos, who knows something about stock valuations from his previous career as a hedge fund manager. Interesting also to Bezos the history buff, who likes to talk about the Cambrian explosion about 550 million years ago, when multicelled life spawned unprecedented variation of species--and with it, a wave of extinctions. Given this perspective, Bezos says, Buffett's analogies about bankrupt businesses "resonate deeply." Now Bezos is spreading the gospel according to Buffett and urging Amazon employees to run scared every day. "We still have the opportunity to be a footnote in the e-commerce industry," he says.

MSCI Barra

RESEARCH BULLETIN

Is There a Link Between GDP Growth and Equity Returns? | May 2010

Introduction

A recurring question in finance concerns the relationship between economic growth and stock market return. Recently, for example, some emerging market countries have experienced spectacular growth, and many institutional investors wonder if they should assign a higher weight to these countries (based on gross domestic product [GDP] rather than market capitalization). These investors hope that this higher weight will be justified by a subsequent higher return.

This question is not new; "supply-side" models have been developed to explain and forecast stock market returns based on macroeconomic performance. These models are based on the theory that equity returns have their roots in the productivity of the underlying real economy and long term returns cannot exceed or fall short of the growth rate of the underlying economy.

In this research bulletin, we empirically test the steps leading from GDP growth to stock returns. We use long-term MSCI equity index data and macroeconomic data to conduct this analysis.

Mechanics of Supply-Side Models

Supply-side models assume that GDP growth of the underlying economy flows to shareholders in three steps. First, it transforms into corporate profit growth; second, the aggregate earnings growth translates into earnings per share (EPS) growth, and finally EPS growth translates into stock price increases.

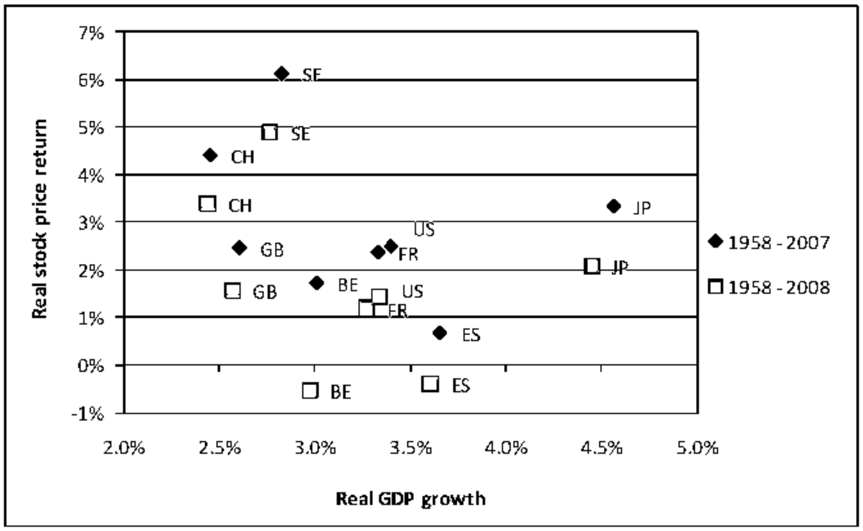
If we further assume that:

- the share of company profits in the total economy remains constant;
- investors have a claim on a constant proportion of those profits;
- valuation ratios are constant;
- the country's stock market only lists domestic companies;
- the country's economy is closed,

then we would expect an exact match between real price increase and real GDP growth. *This theory is simple and makes intuitive sense. But is it true in practice?*

Several studies (Dimson et al. [2002], Ritter [2005]) have examined whether countries with higher long-run real GDP growth also had higher long-run real stock market return. The surprising result was contrary to expectations -- the correlation between stock returns and economic growth across countries can be negative! Our own analysis confirms this empirical finding: Exhibit 1 plots stock returns versus GDP growth for eight developed markets between 1958 and 2008 and also shows negative correlation. Note, however, that these tests are dependent on the starting and ending point of the period analyzed; by changing the period by only one year to 1958-2007, we get very different results (although the observed correlation in this example is still negative). For example, the annualized return for Belgium is changed from 1.7% to -0.5%.

Exhibit 1: Annual real GDP growth versus annual real stock returns, 1958 – 2007 and 1958 – 2008



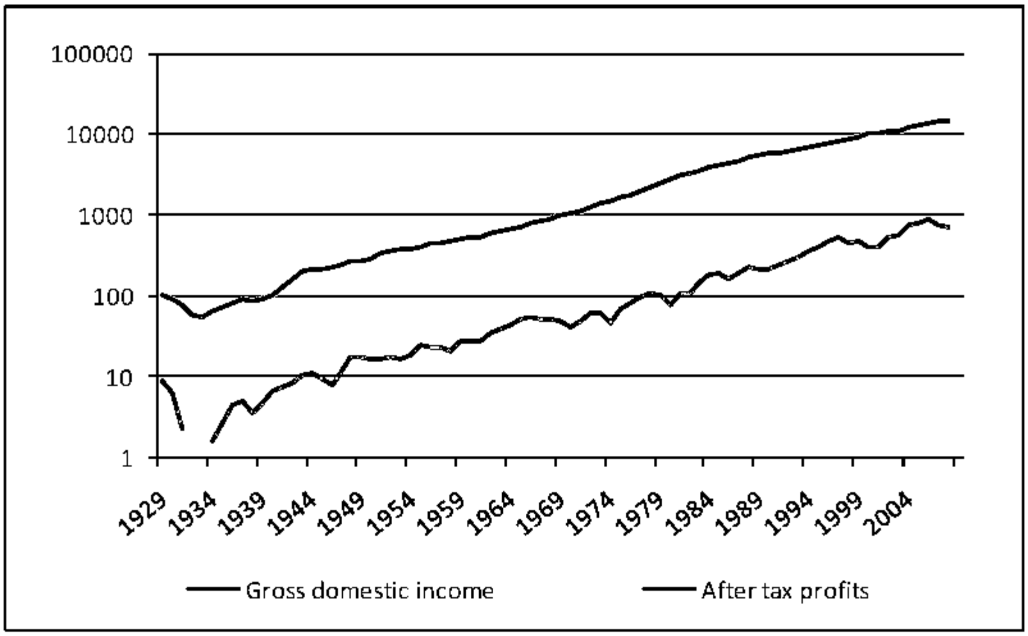
Source: MSCI Barra, IMF, OECD. Growth rates are annualized.

How can we reconcile these empirical findings with the theoretical argument? We will examine the steps leading from GDP growth to stock market performance and show that many assumptions of supply-side models can be challenged and need to be refined.

GDP and Aggregate Earnings

We start by examining the relationship between GDP and aggregate corporate earnings. In Exhibit 2, we use the United States as an example and plot US GDP and corporate earnings (which represent 4-6% of the GDP) from 1929 until 2008. We infer that growth of GDP and aggregate corporate earnings have been remarkably similar throughout the last 80 years, with the exception of 1932 and 1933 when profits were actually negative. This supports the first assumption of supply-side models: over the long run, aggregate corporate earnings tend to grow at the same pace as GDP.

Exhibit 2: Gross domestic product and after-tax corporate profits in the United States, 1929 – 2008



Source: US Department of Commerce, annual data as of 2008. Note that negative values cannot be represented on a log-scale graph.

Aggregate Earnings and EPS

We next examine the theory that aggregate corporate earnings growth translates into EPS growth. This assumption may be somewhat hasty (Bernstein and Arnott [2003]).There is indeed a distinction between growth in aggregate earnings of an economy and the growth in earnings per share to which *current* investors have a claim. These two growth rates do not necessarily match, since there are factors that can dilute aggregate earnings. A portion of GDP growth comes from capital increases, such as new share issuances, rights issues, or IPOs, which increase aggregate earnings but are not accessible to current investors. In fact, investors do not automatically participate in the profits of new companies. When buying shares of new businesses, they have to dilute their holdings in the "old" economy or invest additional capital. This dilution causes the growth in EPS available to current investors to be lower than growth in aggregate earnings. A simple measure of dilution suggested by Bernstein and Arnott is the difference between the growth of the aggregate market capitalization for a market and the performance of the aggregate index for that market. Based on very long term US data, this dilution is estimated to subtract 2% from real GDP growth.

EPS and Stock Prices

The last assumption in the theory that leads from GDP growth to equity performance is that EPS growth translates into stock price increases. This is only true however, if there are no changes in valuations (the price to earnings ratio) as illustrated by the equation below:

$$1 + r = (1 + g_{rEPS})(1 + g_{PE})$$

where r is the price return of the stock, g_{rEPS} is the growth rate in real earnings per share and g_{PE} is the growth rate in the price-to-earnings ratio. Some research claims that there are no reasons for valuations to change over the long term, which supports the supply-side models. However, empirical tests show that valuations have generally expanded over the last 40 years (see 'What Drives Long Term Equity Returns?' MSCI Barra [2010]). This can be explained in several ways, for example, due to different regimes (declining inflation), better market and information efficiency, or improved corporate governance.

Exhibit 3 correlates the historical data for the MSCI developed market countries over the last 40 years. To relate the data to economic growth, the last two columns display the amounts by which EPS and price returns have fallen compared to GDP growth rates.

We find that the mean "slippage" between real GDP growth and EPS growth is 2.3%. On average, stock prices have followed GDP more closely; the mean difference is only 0.3%. This is a consequence of the considerable expansion (2.0%) in the PE ratio during the same period that offset the earnings dilution effect.

Exhibit 3: Real GDP, real earnings per share, real price growth and price-to-earnings growth[1] for selected countries, 1969 – 2009

1969 - 2009	Real GDP growth rates	Real stock price return	Real EPS growth rates	PE change	GDP growth minus stock price return	GDP growth minus EPS growth
Australia	3.1%	0.0%	0.5%	-0.4%	3.1%	2.7%
Norway	3.0%	2.7%	0.9%	1.8%	0.3%	2.1%
Spain	3.0%	-1.4%	n. a.	n. a.	4.5%	n. a.
Canada	2.9%	2.5%	1.3%	1.1%	0.4%	1.6%
United States	2.8%	1.6%	0.0%	1.6%	1.2%	2.8%
Japan	2.8%	1.5%	not meaningful	not meaningful	1.3%	n. a.
Austria	2.6%	0.6%	-1.9%	2.6%	1.9%	4.6%
Netherlands	2.4%	1.9%	-2.6%	4.6%	0.5%	5.1%
France	2.3%	1.7%	n. a.	n. a.	0.6%	n. a.
Belgium	2.3%	0.6%	-2.8%	3.5%	1.7%	5.3%
United Kingdom	2.2%	1.1%	1.6%	-0.6%	1.1%	0.5%
Sweden	2.1%	5.8%	4.4%	1.3%	-3.5%	-2.3%
Italy	2.0%	-1.7%	n. a.	n. a.	3.8%	n. a.
Germany	1.8%	1.6%	-1.1%	2.7%	0.3%	2.9%
Denmark	1.7%	3.6%	1.2%	2.4%	-1.9%	0.5%
Switzerland	1.5%	2.6%	-0.5%	3.1%	-1.1%	2.0%
Average	2.4%	2.0%	0.1%	2.0%	0.3%	2.3%
MSCI ACWI[1]	2.7%	2.1%	0.6%	1.5%	0.6%	2.1%

Source: MSCI Barra, US Department of Agriculture, OECD. Average based on all countries excluding Spain, Japan, France, Italy.

From this data we infer that although the average long term equity performance was similar to GDP growth, this was due to the increasing valuations offsetting the dilution effect.Variance among countries is striking. In one extreme case, the EPS of the MSCI Sweden Index has grown 2.3% faster than Sweden's GDP and the index itself has performed 3.5% better than the GDP. At the other extreme, the MSCI Spain Index grew 4.5% slower than Spain's GDP.

International Considerations and Other Arguments

The prior examples suggest there may be complications in the simple model that has GDP mechanically flowing through to stock returns.

For example, part of the difference among countries may be explained by the different level of openness of the economies, and by the disparities in the proportion of listed companies. Indeed, a company's profit can be earned outside the country in which it is listed. As economic globalization continues, more firms operate in several locations throughout the world.

[1] The price return, EPS growth rate, and PE change for the MSCI All Country World Index (ACWI)I is based on a combination of MSCI World Index data prior to December 31, 1987, and MSCI ACWI data after that date. Similarly, real GDP growth is based on summing GDPs of countries included in the MSCI World Index prior to December 31, 1987, and in MSCI ACWI after that date.

Consequently, parts of the production process for these multinational firms are not reflected in the country's GDP. This can create a discrepancy between the company's performance and the local economy. On the other hand, the company's revenues and share price largely depend on the global GDP growth, as an increasing proportion of its products is sold abroad.

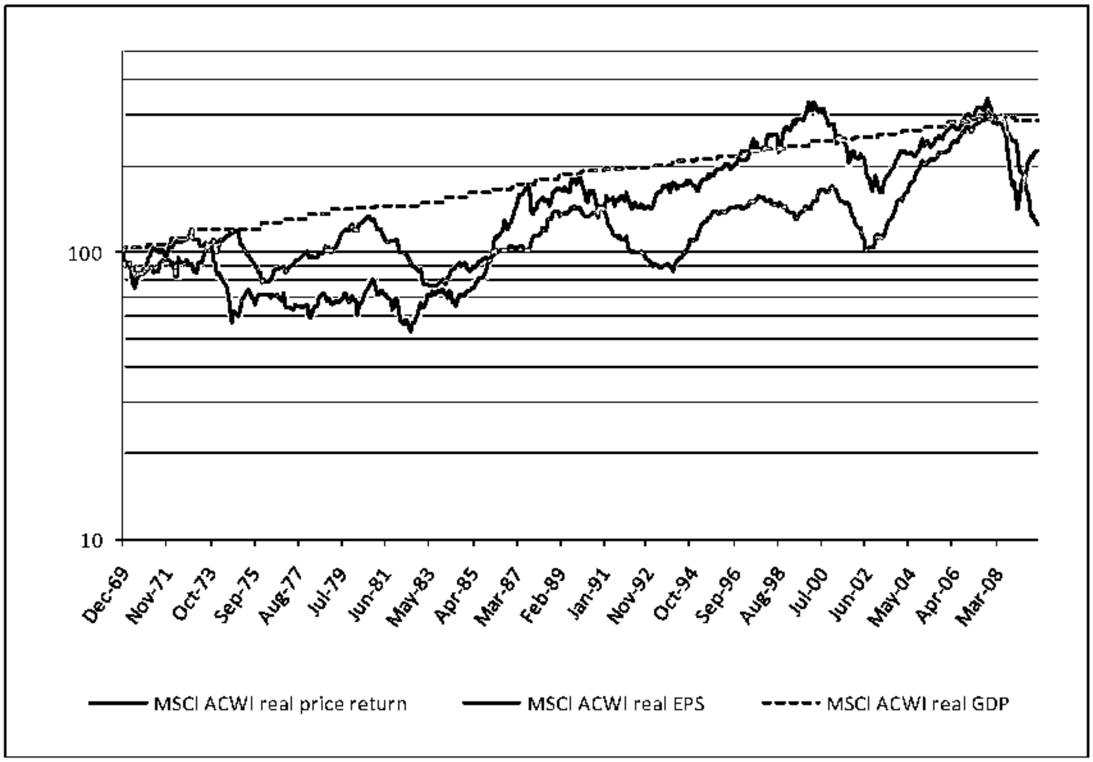
This decoupling effect is amplified because the biggest firms in each country, and consequently in each country index, tend to be multinational companies. This decoupling between company listing and company contribution to GDP may disappear if we consider an aggregate of countries. Indeed, by taking a large set of countries (ideally the whole global economy), the majority of production – even those of multinational firms – will become domestic and contribute to the aggregate GDP. When comparing the growth of this aggregate GDP to the performance of the aggregate stock market of the same set of countries, the distorting effect of companies listed in one country and producing in another can be almost totally discarded.

In Exhibit 4, we investigate this idea by looking at global equity returns as represented by a combination[2] of the MSCI All Country World Index (ACWI) and the MSCI World Index, and comparing them to the GDP growth of countries included in the same indices. The countries included in this combined index are a good approximation of the global economy. Although it only included 16 developed market countries in 1969 (US, Canada, Japan, Australia, and countries from Europe), those countries represented 78% percent of the global economic production, as measured by their real GDP. The coverage ratio jumped above 80% in 1988, when emerging markets are included in the combined index, and reached 93% in 2009.

Using this aggregation, we see that long term trends in real GDP and equity prices are more similar for global equities than for most individual markets. The annual real GDP growth rate of the MSCI World and MSCI ACWI countries between 1969 and 2009 was 2.7% and real price return was 2.1%. However, the dilution effect is still observable as real EPS grew at a 0.6% annual pace -- the wedge between GDP growth and EPS growth was 2.1% over the last 40 years, but real stock price lagged GDP growth by only 0.6%. This can be attributed to the extreme expansion in the PE ratio during the long bull market of the 1980s.

[2] Global equity return calculation is based on a combination of MSCI World Index returns prior to January 1, 1988, and MSCI ACWI returns after that date.

Exhibit 4: MSCI ACWI[3] real price return, real EPS and real GDP growth, 1969 – 2009

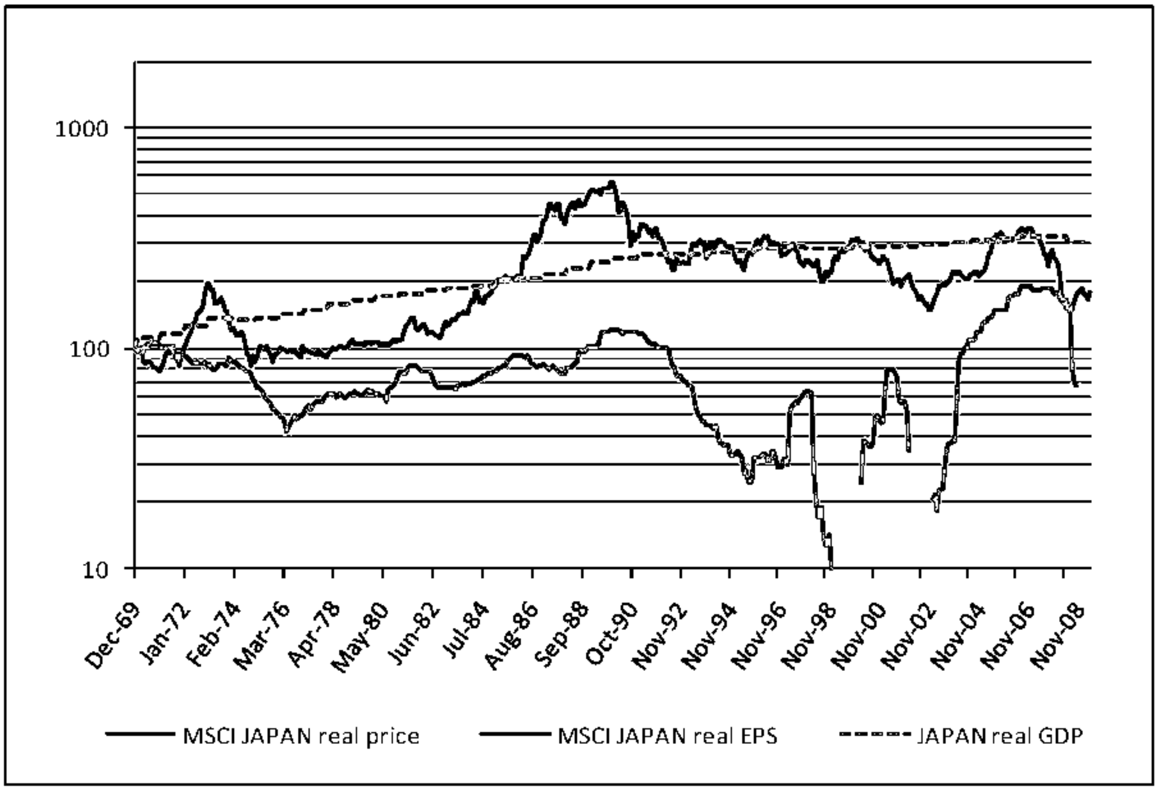


Source: MSCI Barra, US Department of Agriculture, data as of December 2009. Real GDP growth is shown as a chain-linked index to avoid the distorting effect of changes in the country composition of the corresponding global equity indices (MSCI World before January 1, 1988 and MSCI ACWI after that date). Real index and per share data is obtained by deflating by the global GDP deflator.

An additional argument by Siegel (1998) to explain the lack of observable correlation between GDP growth and stock returns is that expected economic growth is already impounded into the prices, thus lowering future returns. As shown in Exhibit 5, Japan is an example of this effect. We see that growth expectations were overly optimistic and 20 years of future growth were already discounted in the 1980s when stock prices grew faster than GDP. In the last two decades, equity performance was negative, while the GDP continued to grow.

[3] MSCI ACWI is replaced by the MSCI World Index prior to January 1, 1988.

Exhibit 5: MSCI Japan Index real price return, real EPS and real GDP growth, in JPY, 1969 – 2009



Source: MSCI Barra, US Department of Agriculture. Note that negative values cannot be represented on a log-scale graph.

Conclusions

We may intuitively think of stock returns as a result of the underlying real economy growth. However, we have observed that long term real earnings growth fell behind long term GDP growth in many countries over the observed period.

Several factors may explain this discrepancy. First, in today's integrated world we need to look at global rather than local markets. Second, a significant part of economic growth comes from new enterprises and not the high growth of existing ones; this leads to a dilution of GDP growth before it reaches shareholders. Lastly, expected economic growth may be built into the prices and thus reduce future realized returns.

In their refined version, supply-side models tie a country's stock returns to its GDP growth, but they do not suggest a perfect match between the two variables. Instead, they view real GDP growth as a cap on long-run stock returns, as other factors dilute GDP before it reaches shareholders.

However, the empirical analysis of the presumed link between GDP and stock growth has certain limitations. Although we use a relatively long-term international equity data set, the analysis results are dependent on the start and end dates of the time series, since the economy and stocks follow cyclical patterns. Another issue concerns the role of investors' expectations. If expectation of future GDP growth is entirely built into today's valuations, stock price movements will tend to precede developments in the underlying economy. A deeper analysis is needed to test for a lag between the two time series.

References

William J. Bernstein and Robert D. Arnott, Earnings growth: the two percent dilution, Financial Analyst Journal, September/October 2003, 47 – 55

Bradford Cornell, Economic Growth and Equity Investing, Financial Analyst Journal, Volume 66, 2010

Jeffrey J. Diermeier, Roger G. Ibbotson and Laurence B. Siegel, The Supply of Capital Market Returns, Financial Analyst Journal, March/April 1984, 74 - 80

Elroy Dimson, Paul Marsh and Mike Staunton, Triumph of the Optimists: 101 Years of Global Investment Returns, 2002, Princeton University Press, Princeton

Jay R. Ritter, Economic growth and equity returns, Pasific-Basin Finance Journal 13 (2005) 489 – 503

Jeremy J. Siegel, Stocks for the Long Run, 1998, Second edition, McGraw-Hill

What Drives Long Term Equity Returns?, MSCI Barra Research Bulletin, January 2010

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MSCI Barra RESEARCH BULLETIN

What Drives Long-Term Equity Returns? | January 2010

Introduction

In this Research Bulletin, we analyze long run returns of international equity markets using historical data spanning the 1975 - 2009 period. We decompose these returns into components and analyze their evolution over time.

This topic has been studied in the past. For example, Ibbotson and Chen (2003) provide a good overview of various decomposition methods and apply them to the US market. However, in our study we use a similar method and present the results using an international view.

Decomposition of the MSCI World Index

We decompose the equity total return (geometric average) into inflation, dividends, and real capital gain. The real capital gain is further broken down into real book value (r.BV) growth and growth in the price to book (PB) ratio. By using book value rather than earnings, we avoid periods with negative earnings where decomposition would not be meaningful. This method is summarized by the following formula:

$$TotalReturn = Inflation + g(PB) + g(r.BV) + DivIncome + Res$$

Residual interactions (*Res*) account for the geometric interaction between the various components when they are compounded over several periods. This term is small compared to the other four. For simplicity, this study ignores the effect of the exchange rates.

First, we decompose the MSCI World Index gross returns from the viewpoint of a US-based investor. The performance is expressed in US Dollars and we measure inflation by US domestic inflation. The results are presented in Exhibit 1.

Exhibit 1: Components of the MSCI World Index gross returns and their volatilities, 1975-2009 and subperiods

Period	1975 - 2009	1975 - 1979	1980 - 1989	1990 - 1999	2000 - 2009	volatility 1975 - 2009
Gross Index Return (USD)	11.1%	16.0%	19.9%	12.0%	-0.2%	14.9%
Inflation (USD)	4.2%	8.1%	5.1%	2.9%	2.6%	1.3%
Price to Book Growth	1.5%	2.3%	8.0%	5.0%	-8.3%	14.0%
Real Book Value Growth	2.1%	0.2%	2.1%	1.4%	3.8%	5.6%
Dividend Income	2.9%	4.6%	3.6%	2.1%	2.2%	0.4%
Residual Interactions	0.4%	0.7%	1.2%	0.5%	-0.5%	0.3%

Source: MSCI Barra and OECD (inflation data); annualized values. Data as of September 30, 2009.

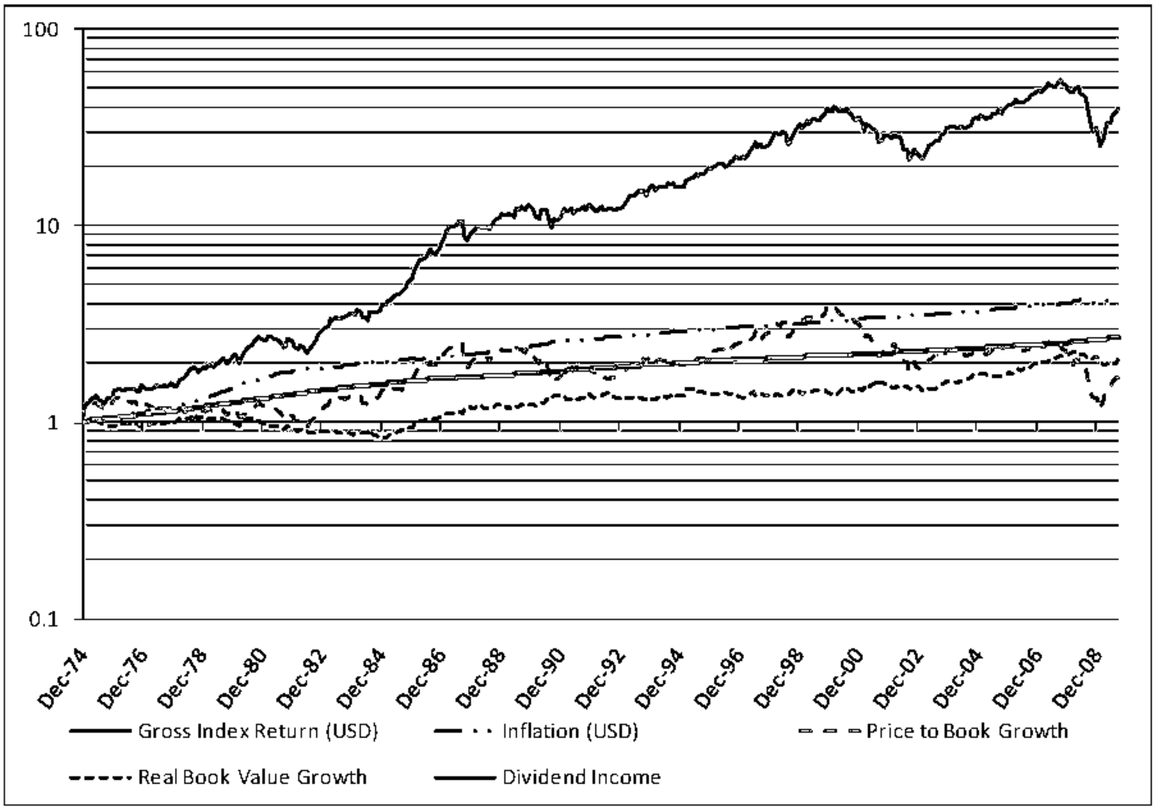
The MSCI World Index annualized gross index return for the total 35-year time span was 11.0%. The biggest component of this return was inflation at 4.2%, contributing more than one third of the total return. Other important components were dividend income (2.9%), emphasizing the importance of dividend reinvestment in long-term investing, and real book value growth (2.0%). Price to book growth contributed the least (1.5%).

When looking at the sub-period breakdown of the return components, interesting patterns emerge. Dividend income was on a downward trend, declining from 4.6% in the 1970s to 2.2% in the current decade. The relatively small effect of the valuation (PB) change in the long run hides a very volatile history: in the last three decades, it was the most important component of equity returns, expanding annually by 8% in the 80s, 5.0% in the 1990s and shrinking by 8.4% in the last decade.

This behavior can also be seen in Exhibit 2, which shows the cumulative contribution of the different return components over time. While inflation, dividend income, and book value present steady growth (barring a slight decline in real book value growth in the early 1980s), the price to book value component represents the source of volatility in the overall equity return.

This observation is also confirmed by the last column of Exhibit 1, where we see the annualized volatilities of the different return components for the complete period. Indeed, the volatility of the PB growth component is 14.0%, just slightly below the overall volatility of 14.9%.

Exhibit 2: Cumulative return of the components of the MSCI World Index (gross), 1975-2009



Source: MSCI Barra and OECD (inflation data). Data as of September 30, 2009.

Decomposition of regional returns

We now apply the same decomposition method to the gross returns of five regional and country indices, expressed in their home currency[1]: MSCI USA, MSCI Japan, MSCI Europe, MSCI Australia, and MSCI UK. The results are presented in Exhibit 3.

[1] Before the inception of Euro in 1999, we use DEM and German inflation for Europe.

Exhibit 3: Components of regional gross index returns and their volatilities, 1975-2009 and sub-periods

	Period	1975 - 2009	1975 - 1979	1980 - 1989	1990 - 1999	2000 - 2009	volatility 1975 - 2009
MSCI USA	**Gross Index Return (USD)**	**11.4%**	**13.3%**	**17.1%**	**19.0%**	**-1.9%**	**15.4%**
	Inflation (USD)	4.2%	8.1%	5.1%	2.9%	2.6%	1.3%
	Price to Book Growth	1.7%	0.7%	6.0%	10.4%	-9.9%	15.6%
	Real Book Value Growth	1.8%	-0.7%	0.6%	2.2%	4.2%	4.5%
	Dividend Income	3.2%	4.8%	4.6%	2.5%	1.8%	0.4%
	Residual Interactions	0.5%	0.4%	0.9%	1.0%	-0.6%	0.4%
MSCI Europe	**Gross Index Return (EUR/DEM)**	**10.7%**	**11.2%**	**18.3%**	**16.1%**	**-2.0%**	**16.6%**
	Inflation (EUR/DEM)	2.7%	4.1%	2.8%	2.6%	2.1%	1.0%
	Price to Book Growth	2.3%	3.2%	7.9%	8.2%	-9.2%	16.1%
	Real Book Value Growth	1.7%	-1.7%	2.3%	2.0%	2.6%	5.7%
	Dividend Income	3.6%	5.4%	4.2%	2.7%	3.0%	0.6%
	Residual Interactions	0.4%	0.3%	1.0%	0.8%	-0.5%	0.3%
MSCI Japan	**Gross Index Return (JPY)**	**5.2%**	**13.5%**	**22.3%**	**-4.0%**	**-4.7%**	**18.3%**
	Inflation (JPY)	1.8%	6.6%	2.3%	1.1%	-0.2%	1.9%
	Price to Book Growth	-0.8%	3.6%	9.7%	-6.6%	-6.9%	18.9%
	Real Book Value Growth	2.9%	0.4%	7.7%	0.9%	1.4%	5.2%
	Dividend Income	1.3%	2.4%	1.2%	0.8%	1.3%	0.4%
	Residual Interactions	0.1%	0.5%	1.4%	-0.2%	-0.2%	0.4%
MSCI Australia	**Gross Index Return (AUD)**	**14.3%**	**25.8%**	**17.8%**	**10.6%**	**9.1%**	**18.4%**
	Inflation (AUD)	5.5%	11.1%	8.3%	2.3%	3.2%	1.3%
	Price to Book Growth	2.7%	10.5%	1.0%	5.3%	-2.0%	19.6%
	Real Book Value Growth	1.2%	-2.6%	3.2%	-1.2%	3.7%	5.9%
	Dividend Income	4.3%	5.2%	4.4%	4.0%	4.1%	0.6%
	Residual Interactions	0.7%	1.6%	0.9%	0.3%	0.2%	0.8%
MSCI UK	**Gross Index Return (GBP)**	**15.4%**	**34.6%**	**23.2%**	**14.2%**	**0.8%**	**19.9%**
	Inflation (GBP)	5.4%	15.4%	6.5%	3.1%	1.9%	2.3%
	Price to Book Growth	4.2%	14.6%	8.2%	7.7%	-7.5%	20.4%
	Real Book Value Growth	0.8%	-3.9%	2.1%	-0.4%	3.4%	7.3%
	Dividend Income	4.1%	5.8%	4.8%	3.3%	3.5%	0.5%
	Residual Interactions	0.8%	2.6%	1.7%	0.5%	-0.4%	1.2%

Source: MSCI Barra, OECD (inflation). AUD inflation is based on Australian Bureau of Statistics data[2]. Data as of September 30, 2009.

We observe similar trends for the US and Europe: the first three periods saw high total returns whereas the last decade had a decline. Valuation ratios showed considerable growth in the 1980s and 1990s for both regions, and inflation was lower in Europe than in the US.

These dynamics were significantly different in Japan. First, during this 35-year period, the annualized performance of the MSCI Japan Index was approximately half that of the other two regions, even after accounting for inflation. Notably, the last two decades in Japan were marked by a continued underperformance, mainly due to the shrinking valuation ratios after the burst of the Japanese bubble. Second, dividend income was less than half of that in the other regions and was not the most important component of the total return after inflation.

Australia and the UK generally outperformed the other regions during the 1975-2009 period in local currency terms. This outperformance is mainly due to their higher inflation rates and dividend yield. The first five-year subperiod (1975-1979) saw exceptional gross returns in both countries (25.8% for the MSCI Australia Index and 34.8% for the MSCI UK Index) due to annual inflation and PB growth rates above 10%. It is also interesting to note that Australia had a positive

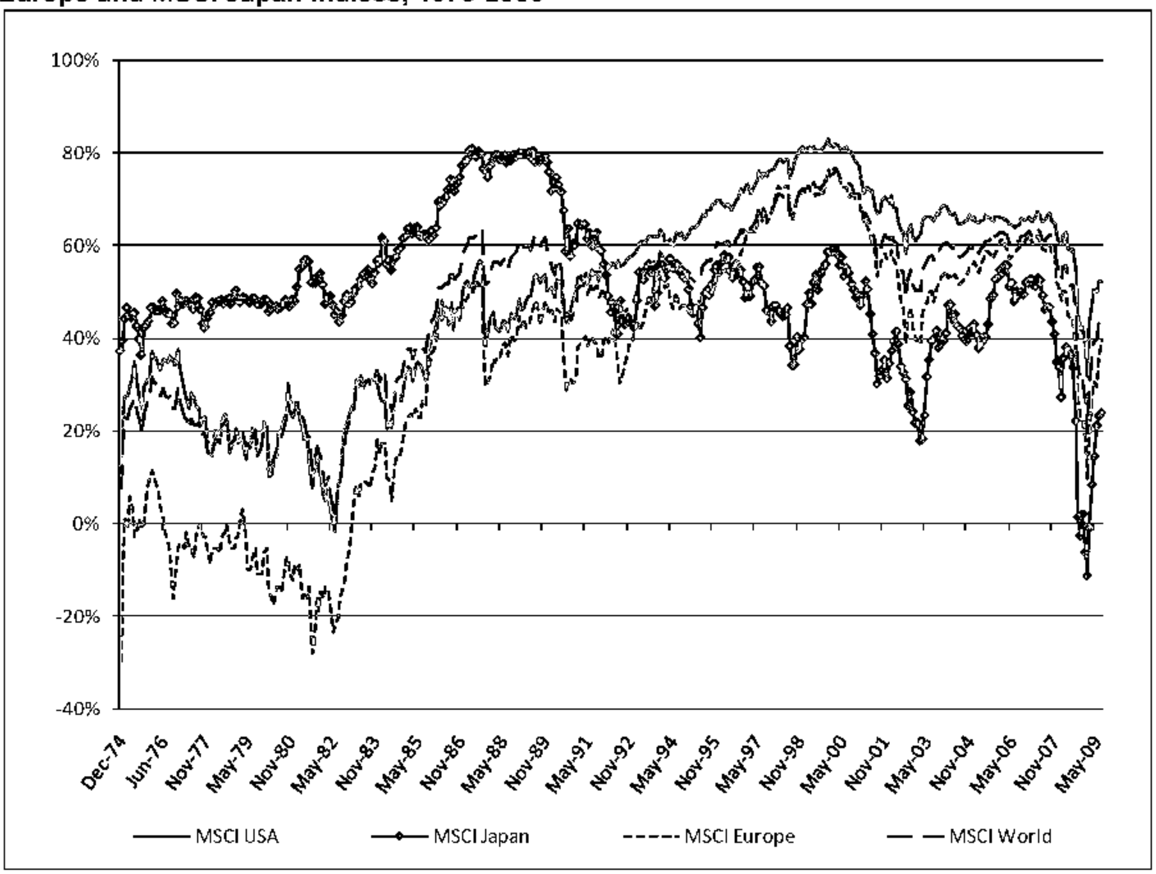
[2] ABS publishes quarterly CPI data. We used linear interpolation to generate monthly series. Note that this process also lowers the volatility of the inflation component.

annualized gross performance of 9.1% in the last decade, due to a relatively high dividend income and a relatively small decline in the PB ratio.

Decomposing price into book value and expectations of excess returns

Next, we take a closer look at the evolution of the price component of the regional indices. To do this, we decompose the price index level. We look at the book value per share, which we assume to be the liquidation value of the companies represented by the index. We also look at the difference between the price and the book value per share, which we attribute to expectations of future excess returns (returns above the return on equity— see Ohlson 1995 for the derivation of this result)[3]. Mathematically, the fraction of the book value component in the price is simply 1/PB, whereas the remaining fraction, 1-1/PB, represents the expectations of excess returns. Exhibit 4 shows the evolution of the latter for the MSCI World, MSCI USA, MSCI Europe and MSCI Japan price indices.

Exhibit 4: Fraction of expectations of excess returns in the MSCI World, MSCI USA, MSCI Europe and MSCI Japan Indices, 1975-2009



Source: MSCI Barra. Data as of September 30, 2009

We observe similar trends throughout the history for the MSCI World, MSCI USA, and to a lesser extent MSCI Europe Indices. From the mid 1970s, expectations of excess returns have been on an increasing trend. They stabilized in the 1980s at around 40-50%. Extreme events (for example, the dot-com bubble and the latest financial crisis) caused expectations of excess

[3] Note that one limitation of this analysis is its reliance on an accounting (as opposed to economic) measure to derive expectations of excess returns.

returns to drop to very low, even negative values, but these recovered to the pre-crisis levels relatively quickly.

These dynamics are again different in Japan. In Japan, expectations of excess returns started off at a higher level in the mid 1970s and reached a peak earlier than the other regions, at the top of the asset bubble of the 1980s. Afterwards, expectations were on a downward trend, and generally stayed below the levels of the other regions. After the dot-com bubble, Japan started to move in parallel with the other regions.

We can infer from this graph that over time, differences in expectations of excess returns have shrunk significantly among the different regions.

Conclusions

We decomposed long run returns of major equity markets into several components. The analysis showed that after inflation, dividend income was the most important part of equity returns for the majority of markets. Growth in real book value had a low, but steady contribution to performance. Changes in valuation tended to smooth out in the long run, but had important implications to equity investing in the short run.

We also analyzed how expectations of future excess returns – directly related to the price to book ratio - have evolved over time for different regions. After the continuing expansion in the 1980s and 1990s, these expectations have stabilized at historically high levels, quickly recovering from their lows in the 2009 due to the financial crisis. At the same time, differences in expectations of excess returns have shrunk significantly among the different regions.

References

Roger G. Ibbotson and Peng Chen (2002), Long-Run Stock Returns: Participating in the Real Economy, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=274150

James A. Olhson (1995), Earnings, Book values, and Dividends in Equity Valuation, Contemporary Accounting Research Vol. 11. No. 2. pp 661-687, http://www.lingnan.net/cferm/files/earnings,bookvalues,and%20dividends%20in%20equity%20valuation.PDF

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Educational Articles

STOCKS

Equity Risk Premiums And Stocks Today

Marek Mscichowski | March 11, 2014

Stocks may appear to be at expensive levels. Looking at Price to Earnings (P/E) multiples of equities and comparing them to their historical averages, however, some commentators (namely, former Federal Reserve Chairman Alan Greenspan and NYU professor Aswath Damodaran) have recently pointed to equity risk premiums as another useful metric for valuing stocks. Unlike P/E multiples, equity premiums take interest rates, some currently at historically low levels historically, into account.

The equity premium is the total expected return (including capital growth and dividends) minus the risk-free rate. The total expected return is currently around 8.5%. The ten-year Treasury yield, an estimate of the risk-free rate, is about 3%. Hence, by our rough arithmetic, the equity premium that compensates investors for the added risk of holding corporate equity over theoretically risk-free U.S. government interest payments is currently about 5.5%.

Historically, the equity premium required by investors has averaged in the range of 3% to 7%. So this premium is about average, while interest rates, in some cases, are at historic lows.

The main reason that interest rates are so low is the Federal Reserve's massive asset-buyback program and abnormally low inflation. Through this lens, the elevated high P/E ratios make more sense, as investors search for returns in a low interest-rate environment. However, the Fed lowered the amount of monthly buybacks by $10 billion, from $85 billion to $75 billion, as 2013 came to a close. It then pared another $10 billion assets in January of this year. The Fed's efforts should eventually increase interest rates, though the timeframe appears to depend on the depth and breadth of an economic recovery. This has lent more urgency to speculation on Fed moves.

If interest rates go up and the required premium stays the same, this will decrease equity prices, all else being equal, as future cash flows are discounted by greater expected total returns. However, Professor Damodaran, who periodically posts his own equity risk premium estimate, argues that over the past decade, estimated returns have circled around the same mean, with equity risk premiums have largely compensated for falling interest rates, which have been in the hands of the Federal Reserve. Still, there are historical precedents for shifts in the total expected return because of either changes in the risk-free rate or equity premiums.

Besides interest rates and required equity premiums, another variable that can affect returns is earnings growth, which ultimately supplies money for returns in the form of dividends and buybacks. In recent years, corporations have been doing well, and the global economy seems to be firming up. Future earnings figures will also affect valuations. Damodaran provides a model (similar to a dividend discount model for a stock) for one to determine the intrinsic value of the S&P 500 Index by providing estimates for the risk-free rate, equity premium, as well as cash returns in the form of buybacks and their assumed growth rates.

What are some possible scenarios and how would they affect investors? Our previous discussion should shed some light. In the worst case scenario, interest rates will grow sharply, while the pace of earnings slow (compared to expectations, at least). This may mean equities are relatively overvalued now. For investors, the best case would be if earnings continue to grow nicely, while interest rates remain subdued. This may mean that the intrinsic value of equities is above the current price. With markets recently reaching all-time highs in some indexes and many stocks trading at premium P/E multiples compared to recent years, looking at the equity risk premium may provide investors with new insights into equity valuation and where stocks can go from here.

Value Line subscribers can compare our total return estimates with current bond yields for an idea of equity risk premium as they differ for each individual stock (In general, riskier stocks require higher premiums). Investors should also focus on our earnings and dividend estimates and projections, when considering if an investment is right for them on a fundamental basis.

At the time of this article's writing, the author did not have positions in any of the companies mentioned.

Using Earnings Forecasts to Simultaneously Estimate Firm-Specific Cost of Equity and Long-Term Growth

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This version: December 13, 2010

Keywords: Cost of equity, expected return, expected earnings growth, residual income model
JEL Classification: G12, G14, G17, G31, M41

We are thankful to James Ohlson (the editor), an anonymous reviewer, Pervin Shroff, K.R. Subramanyam, and especially Steven Monahan (the discussant), for their insightful comments and suggestions. The paper also benefitted from the comments received from the participants of research seminars at UC Irvine, Santa Clara University, Southern Methodist University, and the 2010 RAST conference. Maria Ogneva acknowledges financial support from the Michelle R. Clayman Faculty Scholar endowment. We are grateful to Suhas Sridharan for her excellent research assistance.

Using Earnings Forecasts to Simultaneously Estimate Firm-Specific Cost of Equity and Long-Term Growth

Abstract

A growing body of literature in accounting and finance relies on implied cost of equity (COE) measures. Such measures are sensitive to assumptions about terminal earnings growth rates. In this paper we develop a new COE measure that is more accurate than existing measures because it incorporates endogenously estimated long-term growth in earnings. Our method extends Easton, Taylor, Shroff, and Sougiannis' (2002) method of simultaneously estimating *sample average* COE and growth. Our method delivers COE (growth) estimates that are significantly positively associated with future realized stock returns (future realized earnings growth). Moreover, the predictive ability of our COE measure subsumes that of other commonly used COE measures and is incremental to commonly used risk characteristics. Our implied growth measure fills the void in the earnings forecasting literature by robustly predicting earnings growth beyond the five-year horizon.

1. Introduction

In this study, we propose a new firm-specific measure of implied cost of equity capital (COE) that is more accurate than existing measures because it incorporates *endogenously* estimated long-term growth in earnings.

Implied COE measures are internal rates of return that equate a firm's current stock price to the sum of discounted future payoffs. Payoffs beyond the short-term horizon are assumed to grow at a certain constant long-term growth rate, which makes growth an important input in COE estimation.[1] Any error in the growth estimate feeds directly into the implied COE. In particular, the more positive (negative) is the error in the long-term growth rate, the more upwardly (downwardly) biased is the implied COE.[2]

Extant implied COE measures assume the same long-term growth rate across all firms (Claus and Thomas 2001; Gode and Mohanram 2003).[3] This assumption is unlikely to hold in practice, however, because a number of factors influence a firm's terminal growth rate, such as the firm's degree of accounting conservatism and expected growth in investment (Feltham and Ohlson 1995; Zhang 2000). Existing measures of implied COE therefore systematically over- or understate growth, which can lead to spurious inferences

[1] This growth rate is often referred to as the terminal growth rate or the growth rate in perpetuity. Throughout the paper we use the terms long-term growth, terminal growth, and growth in perpetuity interchangeably.

[2] Valuation textbooks emphasize that firm valuation can be highly sensitive to the assumed terminal growth rate of earnings (Penman 2009; Whalen et al. 2010). For example, Damodaran (2002) states that "of all the inputs into a discounted cash flow valuation model, none can affect the value more than the stable growth rate."

[3] Another commonly used COE measure developed by Gebhardt et al. (2001) assumes a convergence in profitability to an industry benchmark over twelve years with a zero terminal growth thereafter. But as Easton (2006) points out, this approach creates systematic biases to the extent that firms with certain characteristics have other expected growth patterns.

(Easton 2006, 2007). Our measure of COE helps avoid such spurious inferences by taking into account a firm's growth rate as *implied by the data*.[4]

Our estimation method builds upon the pioneering work of Easton, Taylor, Shroff, and Sougiannis (2002) (hereafter, ETSS). ETSS develop a method to simultaneously estimate the *average* COE and *average* earnings growth rate for a given portfolio of firms. Despite this method's conceptual and practical appeal, however, it cannot be used in many research settings because it only allows one to estimate the *average* COE and growth rate for a given sample of firms. In this paper we extend the ETSS approach to allow for estimation of COE and expected earnings growth for individual firms. Our approach is motivated by the industry practice of using firm peers when valuing privately-held companies. Practitioners often compare a given firm against firms with similar characteristics to determine an appropriate COE and/or growth rate (Pratt and Niculita 2007; Damodaran 2002). Accordingly, our method estimates a firm's COE (growth) as the sum of the COE (growth) typical of firms with the same risk-growth profile plus a firm-specific component. Empirically, COE and growth are estimated by regressing the ratio of forecasted earnings to book value of equity on the market-to-book ratio and a set of observable risk and growth characteristics.[5]

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[4] Developing a more accurate and less biased implied COE measure is important given the increasing use of implied COE measures in accounting and finance literature. Implied COE measures have been used to shed light on the equity premium puzzle (Claus and Thomas 2001; Easton et al. 2002), the market's perception of equity risk (Gebhard et al. 2001), risk associated with accounting restatements (Hribar and Jenkins 2004), dividend taxes (Dhaliwal et al. 2005), accounting quality (Francis et al. 2004), legal institutions and regulatory regimes (Hail and Leuz 2006), and quality of internal controls (Ogneva et al. 2007), as well as to test intertemporal CAPM (Pastor et al. 2008), international asset pricing models (Lee et al. 2009), and the pricing of default risk (Chava and Purnanandam 2010).

[5] Specifically, we use the CAPM beta, size, book-to-market, and momentum as the observable risk characteristics, and we use analysts' long-term growth forecast, the difference between the industry ROE and the firm's forecasted ROE, and the ratio of R&D expenses to sales as the observable growth characteristics. We take the part of COE (growth) that is not explained by these observable risk (growth)

We test the accuracy of our COE estimates by examining their ability to explain future stock returns for a sample of I/B/E/S firms over the 1980 to 2007 period. The analysis uses unadjusted earnings forecasts as well as forecasts adjusted for predictable analyst biases as in Gode and Mohanram (2009). We find that using either adjusted or unadjusted earnings forecasts our implied COE measure has return predictive ability that is incremental to the benchmark COE measures and commonly used risk proxies (the CAPM beta, size, book-to-market, and past twelve-month stock returns). Specifically, our measure remains significantly positively related to future realized stock returns even after controlling for the benchmark COE measures and commonly used risk proxies. In contrast, none of the benchmark COE measures is significantly related to future stock returns after controlling for our measure. Additional tests that rely on Easton and Monahan's (2005) methodology suggest that our implied COE measure delivers the lowest measurement error compared to the benchmark COE estimates.

Analysis of the cross-sectional determinants of relative predictive ability of our measure compared to the best performing benchmark—COE based on the GLS model (Gebhardt et al. 2001)—suggests that our measure performs markedly better for firms that are very different from other firms in the industry in terms of their profitability, forecasted long-term growth, and past sales growth, or very different from the average firm in the sample in terms of size, book-to-market ratio, CAPM beta, or past returns.

characteristics to be due to unobservable risk (growth) factors. Examples of such risk factors may include the risk of increased competition and extreme weather, credit risk, and litigation risk as perceived by market participants but not fully captured by the set of observable risk characteristics that we consider. We acknowledge that the set of risk and growth characteristics that we use in the estimation may be incomplete, however the flexibility of our method allows incorporating any number of additional factors pertinent to a specific study.

These findings may guide future empirical research in the choice of an appropriate COE measure.

To examine the accuracy of our implied growth estimates, we test their predictive ability with respect to future earnings growth rates. Specifically, we estimate the realized growth in aggregate four-year cum-dividend earnings from years $t-1$ to $t-4$, to years $t+5$ to t 8. We find that our implied growth estimates are significantly associated with future earnings growth: when we sort stocks into quintiles based on implied growth, the annualized growth spread between the top and bottom quintiles is between 2.5% and 10.4% (5.5% and 8.6%) per annum using our unadjusted (adjusted) measure. Multivariate regression analyses indicate that the predictive ability of our implied growth measure is entirely attributable to the growth characteristics used in its estimation, which leads us to further investigate the role of observable characteristics in our method.

Our method embeds observable risk and growth characteristics into the residual income valuation framework. The valuation equation determines the optimal weights on these characteristics, and allows estimating COE and growth components due to unobservable risk and growth factors. It could be the case however that most of the predictive ability of our COE and growth measures comes from simply relying on observable characteristics. To examine this possibility, we construct a statistically predicted COE (growth) based on the same risk (growth) characteristics that we use in our model [6] and compare its predictive ability to the predictive ability of our implied COE (growth) measure. The analysis shows that (1) the statistically predicted return

[6] Specifically, we use a cross-sectional prediction model that first regresses past realized returns (growth) on past risk (growth) characteristics and then applies the resulting coefficients to current return (growth) characteristics to arrive at a return (growth) forecast.

measure does not have significant return predictive ability, and (2) although the statistically predicted growth is significantly associated with future long-term growth, it does not subsume the predictive ability of our implied growth measure. Therefore, it appears that embedding risk and growth characteristics into the valuation equation is superior to constructing simple statistical predictions using the same characteristics.

In addition to examining COE and growth rates for individual firms, we revisit ETSS' findings with respect to the market-wide levels of COE and earnings growth. Using our method, we obtain estimates of average implied COE and equity risk premia that are significantly lower than those obtained from the ETSS model and more in line with low risk premia from prior theoretical studies (Mehra and Prescott 1985).

Our paper contributes to the literature in several ways. First, we expand the literature on COE estimation by developing an implied COE measure that relies on endogenously determined long-term earnings growth. By taking into account growth rates implied by the data, our implied COE measure is less likely to be biased due to using incorrect terminal growth assumptions. Second, our COE estimation marries the implied COE approach with a long-standing industry practice of using benchmark characteristics in firm valuation. The flexibility of our method allows incorporating any risk and growth characteristics that are pertinent to a specific study. Third, our implied growth measure fills the void in the earnings forecasting literature by robustly predicting earnings growth beyond the five-year horizon.[7] Finally, we contribute to the equity premium literature by

[7] We are not aware of any papers that construct and validate forecasts of terminal growth, or even growth beyond five-year horizon. However, several papers forecast earnings over horizons beyond two years. For example, Chan et al. (2003) and Gao and Wu (2010) forecast earnings growth over the next five years, while Hou et al. (2010) forecast three-year-ahead earnings. Estimates from these models may serve as an alternative to short-term analysts' forecasts.

providing a measure that delivers average firm-level equity risk premia consistent with a theoretically justified low implied market-wide risk premium.

The rest of the paper is organized as follows. Section 2 discusses our estimation of firm-level COE and growth. Section 3 describes the data and variable estimation. In Section 4 we present the empirical results. Section 5 contains robustness checks and additional analyses. Session 6 provides concluding remarks.

2. Estimation of Implied Cost of Equity and Growth

In this section, we develop a method to simultaneously estimate firms' COE and expected earnings growth using stock prices, book values of equity, and earnings forecasts. Our method extends Easton, Taylor, Shroff, and Sougiannis (2002) (ETSS), who simultaneously estimate *average* COE and expected earnings growth for a given sample of firms.

Similar to ETSS, our approach is based on the residual income model (e.g. Ohlson 1995), which expresses firm value as the book value of equity plus the discounted sum of expected residual earnings: [8]

$$P_0^i = B_0^i + \sum_{t=1}^{\infty} \frac{E_t^i - r^i B_{t-1}^i}{(1+r^i)^t} \tag{1}$$

where P_0^i is the market value of equity, B_0^i is the book value of equity, E_0^i is expected earnings for year t given information at $t=0$, and r^i is the COE (unless

[8] The residual income model is equivalent to the discounted dividend model assuming the clean surplus relation, i.e. the book value of equity at the end of year $t+1$ is equal to the book value of equity at the end of year t plus net income for year $t-1$ minus dividends for year $t+1$.

specifically stated otherwise, we use COE and expected return interchangeably throughout the paper).

Following ETSS, we re-write the valuation equation using finite (four-year) horizon forecasts and define g^i as the perpetual annual growth rate such that:

$$P_0^i = B_0^i + \frac{X_{cT}^i - (R^i - 1)B_0^i}{R^i - G^i} \tag{2}$$

where $G^i = (1+g^i)^4$ is one plus the expected rate of growth in four-year residual income, $R^i = (1+r^i)^4$ is one plus the four-year expected return, $X_{CT}{}^i =$ $\sum_{t=1}^{4} E_t + \sum_{t=1}^{3}((1+r)^{4-t} - 1)d_t$ is expected aggregate four-year cum-dividend earnings, and d_t is expected dividends in year t given information at $t=0$.

In order to estimate COE and growth, ETSS re-arrange valuation equation (2) as:

$$X_{CT}{}^i = G^i - 1 \quad (R^i - G^i)MB^i \tag{3a}$$

ETSS further observe that the sample average R and G in equation (3a) can be estimated from the intercept and the slope in a cross-sectional regression of the ratio of cumulative earnings to book value on the market-to-book ratio:

$$X_{CT}{}^i / B_0{}^i = \gamma_0 + \gamma_1 MB^i + \varepsilon^i \tag{3b}$$

where $\gamma_0 = \overline{G} - 1$, $\gamma_1 = \overline{R} - \overline{G}$, and $\varepsilon^i = \varepsilon^i{}_G(1 - MB^i) + \varepsilon^i{}_R MB^i$. The $\overline{R}$ and $\overline{G}$ are the sample means of R^i and G^i respectively, and $\varepsilon^i{}_R = R^i - \overline{R}$ and $\varepsilon^i{}_G = G^i - \overline{G}$ are the firm-specific deviations of R^i and G^i from their sample means.

Estimating regression (3b) using OLS obtains sample means of COE and growth $\overline{R} = \gamma_0 + \gamma_1 + 1$ and $\overline{G} = \gamma_0 + 1$, leaving firm-specific components of R and G unidentified.

Our approach introduces two innovations to the ETSS method. First, we explicitly recognize that COE and growth rates are associated with certain firm characteristics.

Specifically, we express a firm's COE (growth) as the COE (growth) typical of firms with the same risk-growth profile plus a firm-specific component due to unobservable risk (growth) factors:

$$R^i = \overline{R} + \boldsymbol{\lambda}_{\mathbf{R}}{}'\mathbf{x}^{\mathbf{i}}_{\mathbf{R}} + \varepsilon^i_R$$
$$G^i = \overline{G} + \boldsymbol{\lambda}_{\mathbf{G}}{}'\mathbf{x}^{\mathbf{i}}_{\mathbf{G}} + \varepsilon^i_G$$

where $\overline{R}$ ($\overline{G}$) is the sample mean of R^i (G^i) in year *t*, $\mathbf{x_R}^{\mathbf{i}}$ ($\mathbf{x_G}^{\mathbf{i}}$) is a vector of observable risk (growth) drivers (the drivers are demeaned to ensure that $\overline{R}$ and $\overline{G}$ can be interpreted as sample means) [9], $\boldsymbol{\lambda}_{\mathbf{R}}$ ($\boldsymbol{\lambda}_{\mathbf{G}}$), is a vector of premia (weighs) on the observable risk (growth) drivers, and ε^i_R (ε^i_G) is a firm-specific component of R^i (G^i) that is due to unobservable risk (growth) factors.[10]

Incorporating observable risk and growth drivers serves two purposes. First, it provides estimates of firm-specific COE and growth rates conditional on observable firm characteristics. Second, it helps to obtain more accurate estimates of *average* COE and growth rates. To see this, note that the estimates of average COE and growth rate ($\overline{R}$ and $\overline{G}$) are derived from the intercept and slope estimates in (3b). The residuals in (3b) are a linear function of the firm-specific components of COE and growth rate ($\varepsilon^i = \varepsilon^i_G(1 - MB^i) + \varepsilon^i_R MB^i$). The residuals are therefore likely to be correlated with firm-specific COE and growth rates, which are in turn correlated with the independent variable in regression (3b) – the market-to-book ratio (e.g. Fama and French 1993; Penman 1996). Note, that

[9] Empirically, we use the CAPM beta, size, book-to-market ratio, and momentum as observable risk drivers, and we use the analyst long-term growth forecast, R&D expenditures and the deviation of firm's forecasted ROE from the industry target ROE as observable growth drivers.

[10] The component due to unobservable risk (growth) factors is defined as the part of COE (growth) that is not explained by the observable risk (growth) drivers. For example, unobservable risk factors may include the risk of increased competition, liquidity risk, credit risk, litigation risk, and political risk as perceived by market participants but not fully captured by the above observable risk drivers.

because the residuals in (3b) are a complex function of the firm-specific COE, growth rate, and market-to-book ratio, it is unclear whether such correlations represent a source of bias in the regression coefficients. Explicitly incorporating observable risk and growth factors in equation (3b) mitigates any concerns regarding the possible bias and may lead to more accurate estimates of average COE and growth rates.

As a second innovation, we decompose residuals ε^i in the cross-sectional regression (3b) into the COE (ε^i_R) and expected growth (ε^i_G) components by jointly minimizing the components of COE and expected growth due to unobservable risk and growth factors, ε^i_R and ε^i_G. For this purpose, we set up the following minimization program:

$$\begin{cases} \underset{\overline{R},\overline{G},\lambda_R,\lambda_G,\varepsilon^i_R,\varepsilon^i_G}{Min} \sum_i w_1^i(\varepsilon^i_R)^2 + w_2^i(\varepsilon^i_G)^2 \\ R^i = \overline{R} + \boldsymbol{\lambda}_{\mathbf{R}}'\mathbf{x}^{\mathbf{i}}_{\mathbf{R}} + \varepsilon^i_R \\ G^i = \overline{G} + \boldsymbol{\lambda}_{\mathbf{G}}'\mathbf{x}^{\mathbf{i}}_{\mathbf{G}} + \varepsilon^i_G \end{cases} \tag{4}$$

where w_1^i and w_2^i are some predetermined non-negative weights (with at least one of the two weights being positive), and the other variables are as defined above.

Intuitively, the minimization function in (4) represents a loss (cost) function that increases with the magnitude of unexplained components of COE and growth. Tying the cost function to unexplained components is akin to Occam's razor principle – everything else being equal, estimates that can be explained by observable factors are preferred to estimates that appeal to some unobservable factors. The weights w_1^i and w_2^i reflect relative importance of components due to unobservable risk and growth factors, respectively. For example, setting w_1^i equal to zero, assumes that growth does not vary across firms beyond variation implied by observable growth factors, i.e. $G^i = \overline{G} + \boldsymbol{\lambda}_{\mathbf{G}}'\mathbf{x}_{\mathbf{G}}^{\mathbf{i}}$.

Appendix A shows that our minimization program (4) is equivalent to the following minimization program that can be estimated using a weighted least squares (WLS) regression:[11]

$$\begin{cases} \underset{\varepsilon^i, \gamma_0, \gamma_1, \lambda_R, \lambda_G}{Min} \sum_i w^i (v^i)^2 \\ \text{s.t.} \quad X^i_{CT} / B^i_0 = \gamma_0 + \gamma_1 MB^i + \boldsymbol{\lambda}_{\mathbf{R}}' \mathbf{x}^{\mathbf{i}}_{\mathbf{R}} MB^i + \boldsymbol{\lambda}_{\mathbf{G}}' \mathbf{x}^{\mathbf{i}}_{\mathbf{G}} (1 - MB^i) + v^i \end{cases} \tag{5a}$$

where the weights w^i are equal to $w_1{}^i w_2{}^i / (w_1{}^i (1 - MB^i)^2 + w_2{}^i (MB^i)^2)$.[12]

Using the coefficient and residual estimates (γ_0, γ_1, $\boldsymbol{\lambda}_{\mathbf{R}}$, $\boldsymbol{\lambda}_{\mathbf{G}}$, and ε^i) from the WLS regression (5a), firm COE (R^i) and growth rate (G^i) are determined as follows (derivation can be found in Appendix A):

$$\begin{aligned} R^i &= \overline{R} + \boldsymbol{\lambda}_{\mathbf{R}}` \mathbf{x}_{\mathrm{R}}{}^{\mathrm{i}} + \varepsilon^i{}_R \\ G^i &= \overline{G} + \boldsymbol{\lambda}_{\mathbf{G}}` \mathbf{x}_{\mathrm{G}}{}^{\mathrm{i}} + \varepsilon^i{}_G, \end{aligned} \tag{5b}$$

where

$$\overline{R} = \gamma_0 + \gamma_1 + 1$$
$$\overline{G} = \gamma_0 + 1$$

$$\varepsilon^i_R = v^i \frac{w^i_2 MB^i}{w^i_1 (MB^i - 1)^2 + w^i_2 (MB^i)^2}$$

$$\varepsilon^i_G = v^i \frac{w^i_1 (1 - MB^i)}{w^i_1 (MB^i - 1)^2 + w^i_2 (MB^i)^2}$$

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[11] Regression (5a) assumes that independent variables are exogenous, i.e. $E[\varepsilon^i \mid MB^i, MB^i x_R{}^i, (1 - MB_i) x_G{}^i] = 0$. A sufficient but not necessary condition for the exogeneity is the assumption that $\varepsilon^i{}_R$ and $\varepsilon^i{}_G$ are independent of MB^i, $x_R{}^i$, and $x_G{}^i$.

[12] Note that the WLS regression restricts neither the magnitudes nor the signs of the risk premia and growth weights, λ_R and λ_G, which are determined endogenously based on earnings forecasts and stock prices.

To summarize, our method allows simultaneously estimating implied COE and terminal growth by incorporating observable risk and growth drivers into the valuation equation, while minimizing COE and growth variation due to unobservable factors.

Estimation Procedure

We estimate firms' COE and growth rates in the two steps detailed below.

Step 1: Each year, we estimate the following cross-sectional regression using WLS with the weights equal to $1 / ((1-MB^i)^2 + (MB^i)^2)$:[13]

$$X^i_{cT} / B^i_0 = \gamma_0 + \gamma_1 MB^i + \underbrace{(\lambda_{Beta} Beta^i + \lambda_{Size} LogSize^i + \lambda_{MB} MB^i + \lambda_{ret} ret^i{}_{12})}_{\lambda_R' x_R^i} MB^i$$
$$+ \underbrace{(\lambda_{Ltg} Ltg^i + \lambda_{dROE} dIndROE^i + \lambda_{RdSales} RdSales^i)}_{\lambda_G' x_G^i}(1 - MB^i) + v^i \qquad (6)$$

where the vector of risk characteristics, $\mathbf{x}_R^i$, corresponds to the three-factor Fama-French model augmented with Carhart (1997) momentum factor: the CAPM beta (*Beta*), market value of equity (*LogSize*), market-to-book ratio (*MB*), and past twelve months stock return (ret_{12}).[14] The vector of growth characteristics, $\mathbf{x}_G^i$, consists of the analysts' long-term growth forecast (*Ltg*), the difference between industry ROE and the firm's average forecasted ROE over years $t-1$ to $t+4$ (*dIndROE*), which serves as a proxy for the mean-reversion tendency in ROEs, and the ratio of R&D expenses to sales (*RDSales*). The latter characteristic serves a dual purpose as a proxy for the extent of accounting

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[13] These weights assume equal weighting of the COE and growth components due to unobservable factors in (4), that is $w_1{}^i = w_2{}^i = 1$. As a robustness check, we vary the ratio of the weights ($w_1{}^i / w_2{}^i$) from 0.5 to 2. Our inferences are robust to these variations.

[14] Leverage is another characteristic associated with equity risk. We do not include leverage in the estimation because Fama and French (1992) show that the power of leverage to predict future stock returns is subsumed by the CAPM beta, size, and book-to-market ratio.

conservatism, which affects terminal growth in residual income (Zhang 2000), and as one of the known predictors of the long-term growth in earnings (Chan et al. 2003).[15]

Calculation of X_{cT}^{i} requires a COE estimate, R^i, which is not known. We use an iterative procedure similar to that described in ETSS to estimate both X_{cT}^{i} and R^i. Namely, we first set R^i equal to 10% for all firms and calculate the initial values of X_{cT}^{i}. We then use obtained X_{cT}^{i} to estimate the WLS regression, which produces revised estimates of R^i. We then re-calculate X_{cT}^{i} using the revised estimates of R^i and again re-estimate the WLS regression. The procedure is repeated until the mean (across all firms) of absolute change in R^i from one iteration to the next is less than 10^{-7}. The estimation is robust to using other initial values of R^i and in most cases involves less than 10 iterations.[16]

Step 2: Using the intercept and the slope of the market-to-book ratio from Step 1, we calculate the mean $\overline{R}$ and $\overline{G}$ as $\overline{R} = \gamma_0 + \gamma_1 + 1$ and $\overline{G} = \gamma_0 + 1$. We use residuals from the same regression to calculate the firm-specific components of R and G, as $\varepsilon^i_R = v^i MB^i / ((MB^i - 1)^2 + (MB^i)^2)$ and $\varepsilon^i_G = v_i (1 - MB_i) / ((MB^i - 1)^2 + (MB^i)^2)$. Finally, we combine estimates $\overline{R}$ and $\overline{G}$ and residuals ε^i_R and ε^i_G, with estimated $\boldsymbol{\lambda}_\mathbf{R}`\mathbf{x}_R{}^i$ and $\boldsymbol{\lambda}_\mathbf{G}`\mathbf{x}_G{}^i$ from

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[15] Our search of growth drivers reveals that the literature on forecasting growth in earnings over long horizons is very sparse. To our knowledge, there are no empirical papers that would forecast growth in *residual* earnings. There are also no papers documenting growth in accounting earnings over horizons exceeding ten years into the future. Chan et al. (2003) explore growth over the ten-year horizon. However, their cross-sectional prediction model forecasts earnings growth only five years into the future. In our sensitivity tests, we have also included other growth predictors suggested in Chan et al. (2003), including past sales growth, earnings-to-price ratio, and alternative conservatism proxies used in Penman and Zhang (2000). Our results are not sensitive to including them in the estimation, and we opt for a parsimonious set of variables to avoid additional sample restrictions.

[16] Note that numerical estimation of implied COE is typical in models that assume different short-term and long-term growth rates in earnings (e.g. Gebhardt et al. 2001, Claus and Thomas 2001). The method proposed here is not more computationally complex than the extant COE estimation methods.

regression (6), and calculate total COE and expected growth as $R^i = \overline{R} + \boldsymbol{\lambda}_R`\mathbf{x}_R{}^i + \varepsilon^i{}_R$ and $G^i = \overline{G} + \boldsymbol{\lambda}_G`\mathbf{x}_G{}^i + \varepsilon^i{}_G$.

3. Data and Variable Estimation

Our sample consists of December fiscal-year-end firms available in *I/B/E/S*, *Compustat*, and *CRSP* from 1980 to 2007. The one- and two-year-ahead analyst earnings forecasts, long-term growth forecasts, realized earnings, stock prices, dividends, and number of shares outstanding are obtained from *I/B/E/S*; book values of common equity are obtained from *Compustat*; CAPM betas, as well as past and future buy-and-hold stock returns are estimated using monthly stock returns from CRSP. We exclude firm-years with negative two-year-ahead earnings forecasts, book-to-market ratios less than 0.01 or greater than 100, or stock prices below one dollar. Our main sample consists of 50,636 firm-year observations. Tests that involve COE based on the PEG model use a smaller sample of 48,033 firm-year observations due to requiring positive earnings forecasts.

Inputs to Simultaneous Estimation of COE and Growth

Our COE and long-term growth measures are estimated by first running the following cross-sectional regression using WLS:

$$\begin{aligned} X^i_{cT} / B^i_0 = {} & \gamma_0 + \gamma_1 MB^i + (\lambda_{Beta} Beta^i + \lambda_{Size} LogSize^i + \lambda_{MB} MB^i + \lambda_{ret} ret^i_{-12}) MB^i x^i_R \\ & + (\lambda_{Ltg} Ltg^i + \lambda_{dROE} dIndROE^i + \lambda_{RdSales} RdSales^i)(1 - MB^i) x^i_G + v^i \end{aligned} \tag{6}$$

where

X_{cT} = four-year cum-dividend earnings forecast, $\sum_{t=1}^{4} E_t + \sum_{t=1}^{3} ((1+r)^{4-t} - 1) d_t$, where E_1 and E_2 are one- and two-year-ahead consensus earnings per share forecasts from *I/B/E/S* reported in June of year $t+1$; E_3 and E_4 are three- and four-year-ahead earnings per share forecasts computed using the long-term growth rate from *I/B/E/S* as: $E_3 = E_2(1+Ltg)$ and $E_4 = E_3(1+Ltg)$;[17] d_1 to d_3 are expected dividends per share calculated assuming a constant dividend payout ratio from fiscal year t;

B_0 – book value of equity from *Compustat* at the end of year t divided by the number of shares outstanding from *I/B/E/S*;

MB – market-to-book ratio, calculated as the stock price from *I/B/E/S* as of June of year $t+1$, divided by per share book value of equity;

Beta – CAPM beta estimated using sixty monthly stock returns preceding June of year $t-1$ (with at least twenty four non-missing returns required);

LogSize – the log of the market value of equity calculated as stock price from *I/B/E/S* as of June of year $t-1$ multiplied by shares outstanding from *I/B/E/S*;

Ret_{-12} – twelve-month buy-and-hold stock return preceding June of year $t-1$;

Ltg – consensus long-term growth forecast from *I/B/E/S* as of June of year $t+1$;

dIndROE – the industry mean ROE (income before extraordinary items divided by the average book value of equity) minus the firm's average forecasted ROE over years $t+1$ to $t+4$. Industries are defined using the Fama and French (1997) 48-industry classification. Industry ROE is calculated as a ten-year moving median ROE after excluding loss firms (Gebhardt et al. 2001);

RDSales – the ratio of R&D expenses to sales.

All variables are demeaned using yearly sample means.

COE from Benchmark Models

We compare the performance of our COE measure to three widely used COE measures derived using an *assumed* long-term earnings growth rate. The first implied COE measure, r_{CT}, is based on Claus and Thomas (2001). It represents an internal rate of return from the residual income valuation model assuming that after five years residual

[17] We substitute missing *Ltg* with $E2/E1 - 1$. Values of *Ltg* greater than 50% are winsorized.

earnings will grow at a constant rate equal to the risk-free rate (proxied by the ten-year Treasury bond yield) minus historical average inflation rate of three percent.

The second implied COE measure, r_{GLS}, is developed by Gebhardt et al. (2001) and is frequently used in both accounting and finance studies. It is derived using explicit earnings forecasts for years t=1 and t=2, and assumes that return on equity converges to the industry median ROE from year t=3 to year t=12. A zero growth in residual earnings is assumed afterwards.

The third implied COE measure, r_{PEG}, is taken from Gode and Mohanram (2003). It is based on the abnormal earnings growth model (Ohlson and Juettner-Nauroth 2005) and assumes a zero abnormal earnings growth beyond year $t-2$.

The details of benchmark COE estimation are in Appendix B.

Adjusting Analysts' Forecasts for Predictable Errors

Prior literature shows that analyst earnings forecasts are systematically biased, with the direction and the magnitude of the bias correlated with various firm-year characteristics (e.g. Guay et al. 2005, Hughes et al. 2008). Using biased earnings forecasts as inputs in the valuation equation inevitably produces biased implied COE estimates (Easton and Sommers 2005). To mitigate the effect of the bias, we follow Gode and Mohanram (2009) and adjust analyst forecasts for predictable errors and then re-compute the implied COE measures using the adjusted forecasts.[18,19]

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[18] We would like to thank Partha Mohanram for sharing his forecast error adjustment codes.

[19] Hughes et al. (2008) suggest that the trading strategy based on exploiting predictable analyst forecast errors does not produce statistically significant returns, which is consistent with the market not being subject to the same biases as analysts. However, it is possible that in some instances stock prices may incorporate earnings expectations biased in the same direction as analyst earnings forecasts. If this is the case, adjusting earnings forecasts for such predictable errors leads to implied COE estimates that do not

We obtain predictable errors in earnings forecasts by first regressing realized forecast error in *k*-year-ahead earnings scaled by price ($FERR_k$, k = 1, 2, 3, and 4) on the forward earnings-to-price ratio, long-term growth forecast, change in gross PP&E, trailing twelve-month stock return, and the revision of one-year-ahead earnings forecast from the forecast made three months earlier. The regressions are estimated annually based on the hold-out sample lagged by *k* years. The obtained coefficients are combined with variables in year *t* to estimate the predictable bias in *k*-year-ahead earnings forecasts. We then correct earnings forecasts for the predictable bias and calculate the adjusted COE and growth rate based on the corrected forecasts. The obtained COE and implied growth rates are labeled as "*adjusted*".

4. Empirical Analyses

Descriptive Statistics

Table 1 reports descriptive statistics for our sample firms.[20] Consistent with other studies that use *I/B/E/S* analyst earnings forecasts, the firms in our sample are relatively large with the mean (median) market capitalization of \$3,631 (\$517) million. The mean CAPM beta is 1.07 which is comparable to the beta of one for the market value-weighted portfolio. The high average long-term growth forecast of 0.171 and the negative average

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represent the market's expectations of future returns, but instead are equal to the market's expectation of future returns plus the predictable return due to subsequent correction of the mispricing. The adjusted COE measure then represents the total COE that the firm faces due to both risk and mispricing. In our empirical analyses, we do not distinguish between the two interpretations of implied COE.

[20] To avoid the influence of extreme observations, we winsorize all variables except future realized returns at the 1st and 99th percentiles.

difference between the industry ROE and the firm's average forecasted ROE, *dIndROE*, are consistent with on-average optimistic bias in analyst earnings forecasts.

Cost of Equity Estimation Results

Our estimation of firms' COE and growth is based on regression (6):

$$X_{cT}^{i} / B_{0}^{i} = \gamma_{0} + \gamma_{1} MB^{i} + (\lambda_{Beta} Beta^{i} + \lambda_{Size} LogSize^{i} + \lambda_{MB} MB^{i} + \lambda_{ret} ret^{i}{}_{12}) MB^{i} x_{R}^{i}$$
$$+ (\lambda_{Ltg} Ltg^{i} + \lambda_{dROE} dIndROE^{i} + \lambda_{RdSales} RdSales^{i})(1 - MB^{i}) x_{G}^{i} + v^{i},$$

where all variables are previously defined in Section 3. Regressions are estimated by year, with an iterative procedure described in Section 2.[21]

Table 2 Panel A reports regression results. The first (last) three columns use unadjusted analyst earnings forecasts (forecasts adjusted for predictable errors). The panel reports time-series averages of estimated regression coefficients (λ). In addition to assessing statistical significance of regression coefficients, we evaluate economic importance of the risk and growth drivers by calculating standardized regression coefficients. Namely, we multiply regression coefficients by corresponding average yearly standard deviations of risk and growth drivers. The obtained standardized coefficients can be interpreted as changes in COE (implied growth) due to one standard deviation increase in the risk (growth) driver.

The results in Panel A of Table 2 indicate that the most important risk (growth) driver is the market-to-book ratio (difference between industry ROE and firm's

[21] Regression (6) is estimated using WLS. As a robustness check, we have replicated estimation using an OLS regression. The results are similar—implied COE measures predict future realized returns with coefficients significantly different from zero—but the predictive ability is weaker (the coefficient on unadjusted COE measure is significantly different from one). This deterioration in COE predictive ability underscores the importance of utilizing theoretically correct weights for the regression residuals.

forecasted ROE, *dIndROE*). The increase in *MB* (*dIndROE*) by one standard deviation corresponds to a decrease (increase) in four-year COE (growth) by 12.9% (10%) using unadjusted forecasts and 9.8% (8.5%) using adjusted forecasts. On annualized basis, these differences correspond to 3.4% (2.4%) and 2.5% (2.1%), respectively.

The signs of coefficients on *MB* and Ret_{-12} are consistent with prior literature. When using adjusted forecasts, the loading on *Beta* is negative, which is inconsistent with the single-period CAPM. However the effect is economically negligible (one standard deviation increase in *Beta* decreases annualized return by 0.2%) and is in line with negative insignificant coefficient documented in asset-pricing tests based on realized returns (Fama and French 1992; Petkova 2006).[22] The loading on size is negative but not economically significant suggesting that size effect is negligible in I/B/E/S sample (Frankel and Lee 1998). Regression based on unadjusted forecasts suggests a negative relation between past returns and COE consistent with the sluggishness in analyst forecasts (Guay et al. 2005).[23] In contrast, regressions based on adjusted forecasts suggest that COE is positively associated with past returns reflecting momentum in stock returns.
[24]

Overall, our estimation produces loadings on risk and growth drivers that are generally consistent with prior literature. In our sample, the book-to-market ratio is the

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[22] The insignificant relation between the CAPM beta and stock returns is a key motivation for alternative asset-pricing models (Merton 1973; Jagannathan and Wang 1996; Lettau and Ludvigson 2001).

[23] When analyst forecasts are sluggish, they do not incorporate the recent positive (negative) earnings news and are therefore biased downward (upward) following recent positive (negative) stock returns. The bias in forecasts mechanically leads to downwardly (upwardly) biased implied COE estimates following positive (negative) stock returns.

[24] Some risk (growth) drivers are not loading significantly in either Unadjusted or Adjusted Forecast regressions. These drivers include CAPM beta, analysts' long-term growth forecast, and size. When we perform estimation excluding these drivers, our validation results are predictably very similar.

most important determinant of COE, while the difference between the firm's forecasted ROE and industry's ROE is the most important determinant of terminal growth.

Panel B of Table 2 reports descriptive statistics of implied COE and terminal growth estimates. The mean (median) of our COE estimate, r_{SE} (where *SE* stands for simultaneous estimation), is 8.2% (7.7%) and the mean (median) of our growth estimate, g_{SE} , is 0.6% (0.4%). Our COE estimates are somewhat lower than those based on the Claus and Thomas model, GLS model, and PEG model (with the means of 11.1%, 10.3%, and 11.1% respectively). When earnings forecasts are corrected for analyst forecast biases, COE estimates from all models decline suggesting that earnings forecasts are on average adjusted downwards to correct for the overall optimistic forecast bias.

Panel C of Table 2 presents means of by-year correlations among the COE estimates. The average correlations between unadjusted (adjusted) r_{SE} and r_{CT}, r_{GLS}, and r_{PEG} are 0.49, 0.71, and 0.53 (0.31, 0.61, and 0.43), respectively. Overall, correlations among all COE measures are positive and significant in majority of sample years, suggesting that they capture the same underlying construct.

Implied COE and Future Realized Returns

In this subsection, we validate the implied COE measures by documenting their association with future realized returns (Guay et al. 2005; Easton and Monahan 2005; Gode and Mohanram 2009).

We first document COE's out-of-sample predictive ability with respect to future stock returns by sorting firms into quintiles of implied COE distribution at the end of June of each year. For each portfolio, we calculate the mean buy-and-hold return for the next twelve months. We also calculate hedge returns as the difference in returns between the top (Q5) and bottom (Q1) quintiles of implied COE.

Figure 1 plots the time-series means of portfolio returns. The magnitudes of hedge returns are reported next to 'Q5-Q1' labels. Panel A reports returns by portfolios based on unadjusted COE measures. Our measure, r_{SE}, exhibits a strong monotonic relation with future realized returns. The difference in returns between the top and bottom quintiles of r_{SE}, Q5-Q1, is equal to 6.5% (statistically significant at the 5% level). In contrast, the predictive ability of r_{CT}, r_{GLS} and r_{PEG} is weak. The hedge returns, Q5-Q1, for r_{CT}, r_{GLS}, and r_{PEG} are only 3.9%, 3.8%, and 0.1% respectively, and not statistically significant for r_{GLS}, and r_{PEG}.

Panel B of Figure 1 plots returns by portfolios based on COE measures adjusted for forecast errors. Performance of all COE measures is markedly improved,[25] with our measure still performing best. The hedge returns, Q5-Q1, increase to 9.3%, 4.4%, 6.8%, and 4.5% for r_{SE}, r_{CT}, r_{GLS}, and r_{PEG} respectively, and are significant at the 1% (5%) level for r_{SE} (all benchmark models). Overall, our COE measure significantly outperforms the benchmark models at the portfolio level.

Next, we investigate the return predictive ability of COE measures at the firm level. Panel A of Table 3 reports the results of cross-sectional regressions of one-year-ahead stock returns on the COE measures. Each slope coefficient has two corresponding t-statistics reflecting how significantly different the coefficient is from zero and one. The slope on a valid COE measure should be significantly different from zero, and not

[25] This result is consistent with Gode and Mohanram (2009) and Larocque (2010) who show that COE based on the PEG model improves its return predictability when analysts' forecasts are adjusted for predictable errors.

significantly different from one. Consistent with the evidence from Figure 1, our measure, r_{SE}, is significantly related to future stock returns, with regression coefficient statistically indistinguishable from one. None of the other measures unadjusted for analyst forecast errors can predict future returns. After the forecast error adjustment, the slopes increase for all measures and become (remain) significantly positive for r_{CT} and r_{GLS} (r_{SE}). The slope on r_{PEG}, although positive, remains insignificant.

Next, we examine the incremental explanatory power of r_{SE} and the benchmark COE measures relative to each other by regressing future realized returns on the pairs of COE measures. The results are reported in Panel B of Table 3. Both unadjusted and adjusted r_{SE} have significant explanatory power after controlling for r_{CT}, r_{GLS}, or r_{PEG}. In contrast, neither of the benchmark COE is significant after controlling for r_{SE}, suggesting that r_{SE} subsumes the predictive power of other COE measures.

Finally, we provide evidence on the relative importance of the two information sources underlying our measure, r_{SE}: (1) the risk profile (i.e. risk characteristics) of the company, and (2) residual COE unexplained by risk characteristics, but implied by the valuation equation. Specifically, we regress realized returns on COE proxies controlling for *Beta*, Size, *B/M*, and past stock returns. Results reported Panel C of Table 3 show that the slopes on both adjusted and unadjusted r_{SE} remain statistically significant. That confirms the construct validity of our measure beyond simply capturing the observable risk profile of the company.[26]

[26] We further explore the role of observable risk characteristics in the sub-section on statistical prediction of returns and growth rates.

Overall, the results in Figure 1 and Table 3 demonstrate that our COE measure is significantly positively associated with future realized returns. Furthermore, it contains information about firms' expected returns that is not captured by the CAPM beta, firm size, book-to-market ratio, past stock returns, as well as other implied COE measures.

Implied Growth Rates and Future Realized Earnings Growth

In this subsection, we validate the implied growth rates by documenting their association with future realized growth in earnings.

Our implied growth measure captures expected growth in four-year cum-dividend residual earnings from period $t+4$ onwards. A direct validation test would involve correlating implied growth with earnings growth from $t-4$ to perpetuity. Such test is infeasible in practice. Accordingly, we estimate growth in four-year cum-dividend earnings from [t, $t-4$] to [$t-5$, $t+8$] as:[27]

$$GR_{t+4,t-8} = X_{t+8}^{cumd} / X_{t+4}^{cumd} - 1,$$

where $X_T^{cumd} = \sum_{t=T-3}^{T} E_t + \sum_{t=T-3}^{T-1} ((1+r)^{4-t} - 1)d_t$, E_t is realized earnings for year t, d_t is dividends declared in year t, and r is the rate of return at which dividends are

[27]A more direct validation requires estimating realized growth in *residual* earnings. We choose not to use growth in residual earnings in our main tests for two reasons. First, if our implied growth and COE estimates are correlated, using our COE estimate to calculate realized residual earnings may cause the latter to be spuriously correlated with our implied growth estimate. Second, when we use risk-free rates to calculate realized residual earnings, over 50% of cumulative residual earnings before extraordinary items (EBEI) over the first four years are negative and thus cannot be used as a base to estimate growth. Percentage of negative observations is lower when operating income before depreciation (OI) is used to estimate residual earnings. Accordingly, we replicate analyses presented in this subsection using growth in residual OI, and obtain a qualitatively similar set of results (untabulated).

reinvested, which is set equal to the risk-free rate at period t.[28] The realized earnings are either earnings before extraordinary items (*EBEI*), or operating income before depreciation (*OI*). Although earnings before extraordinary items correspond more directly to earnings underlying our implied long-term growth, it is frequently negative or close to zero causing problems when used as a basis for calculating growth. Using growth in operating income before depreciation mitigates this problem.

Table 4, Panel A contains descriptive statistics for the growth rates in four-year cum-dividend earnings. The mean (median) growth rates are 0.48 (0.30) for *EBEI* and 0.52 (0.32) for *OI*. These growth rates can be interpreted as a geometric average growth over four years, and they correspond to annualized rates of 10% (7%) for *EBEI* and 11% (7%) for *OI*.[29]

Figure 2 plots mean growth rates by quintiles of the implied growth measures. Casual observation suggests a positive association between the implied and realized growth rates, except when of unadjusted implied growth is used to predict growth in *OI*. These observations are formally confirmed in regression analysis. Specifically, we regress realized growth rates on the quintile rank of unadjusted (adjusted) implied growth, $R(g_{SE})$. The regressions use a pooled sample, with time fixed effects and standard errors clustered by firm and year. The results are reported in Panels B and C of Table 4. The coefficients on the quintile ranks of unadjusted (adjusted) implied growth rate are 0.122 (0.098) and 0.026 (0.060) when predicting growth in *EBEI* and growth in *OI*,

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[28] By using a risk-free rate we avoid spurious correlations with implied growth rates that could arise had we used previously estimated implied COE estimates. The results are robust to using a uniform 10% rate as in Penman (1996), or a 0% rate that assumes no dividend reinvestment.

[29] We do not use annualized growth rates in the analysis because we cannot annualize four-year growth rates that are less than negative 100%.

respectively. These slope coefficients multiplied by four can be interpreted as average differences in four-year earnings growth between the extreme quintiles of implied growth. On annualized basis, the above coefficients correspond to 10.4% (8.6%) and 2.5% (5.5%) differences in realized growth rates, respectively. All the slope coefficients, except the of the one from regressing *OI* growth on unadjusted implied growth, are statistically significant at the 1% level. Overall, we find that our implied growth measure is a statistically and economically significant predictor of future growth in earnings.

Next, we investigate whether implied growth retains ability to predict future realized growth after controlling for the growth drivers underlying implied growth estimation. For that purpose, we regress future realized growth rates on quintile ranks of implied growth, $R(g_{SF})$, and control variables – analysts' predicted earnings growth, *Ltg*, deviation of industry's ROE from the firm's forecasted ROE, *dIndROE*, and the ratio of R&D expenses to sales, *RDSales*. The results reported in Panels B and C of Table 4 suggest that the predictive ability of our implied growth measure derives entirely from the growth drivers – none of the coefficients on implied growth ranks remains statistically significant after controlling for growth characteristics. While this result uncovers the ex-post source of predictive ability of implied growth *within our estimation method*, it does not imply that these growth drivers can be successfully combined in a simple statistical prediction model ignoring information contained in the valuation equation. We investigate the relative performance of simple statistical earnings growth prediction in the next subsection.

Overall, the implied growth measures are predictive of future long-term growth in earnings, with predictive ability stemming from the growth drivers. The analyses in this subsection are, however, subject to an inherent survivorship bias, which is unavoidable when measuring growth over long horizons. We further investigate the effects of the bias in Section 5.

Statistical Prediction of Returns and Earnings Growth

The predictive ability of our implied COE and growth measures partly derives from the risk and growth drivers that are embedded in the valuation equation. We next investigate how our valuation-model-based estimates compare to predictions from simple statistical models based on the same risk or growth drivers.

First, we construct statistically predicted returns. For this purpose, we estimate hold-out cross-sectional regressions of realized one-year returns for year t on the risk drivers from year t–1 (market-to-book ratio, logarithm of market value of equity, CAPM beta, and prior twelve-month return). We combine obtained coefficients with risk drivers at time t to come up with a statistical forecast of year $t+1$ realized return (*Stat_pRet*).

To compare the predictive ability of the obtained return forecasts to our implied COE, we regress future realized returns on quintile ranks of the predicted return measure (implied COE). Due to the hold-out sample requirements, these regressions are based on the 1981 – 2007 sample period. Panel A of Table 5 reports regression results. The slope coefficients multiplied by four can be interpreted as an increase in average one-year-ahead return from the bottom to the top quintile of statistical return forecast (implied COE). The results suggest that statistically predicted returns have little forecasting ability—the average change in realized returns between extreme quintiles is around two percent (=0.005*100%*4) and is not statistically significant. In contrast, implied COE based on unadjusted (adjusted) analysts' forecasts yields an average change of 6.8 (9.6)%

(calculated as 0.017*100%*4 (0.024*100%*4)), significant at least at the 5% level. Overall a simple statistical return forecast based on the same risk drivers as our COE measure, does not achieve the predictive power of the latter.

Next, we construct statistically predicted long-term earnings growth. Each year t, we use a hold-out sample lagged by eight years to regress past realized four-year cum-dividend earnings growth rates ($GR_{t-4,t}$) on the growth characteristics (*Ltg*, *dIndROE*, and *RDSales*) from year t-8. We then combine the obtained coefficients with the growth characteristics from year t to calculate a statistical predictor of future growth in four-year cum-dividend earnings ($Stat\_pGR_{t+4,\, t-8}$).

Panels B and C of Table 5 report regressions of realized growth rates on the quintile ranks of both the implied and statistically predicted growth. Due to the hold-out sample requirements, these regressions are based on the 1987 – 2001 sample period. For this period, the implied growth measure exhibits a stronger predictive ability – the coefficients on $R(g_{SE})$ are higher than in Panels B and C of Table 4, and significant at least at the 1% level. The implied growth measure retains incremental predictive ability after controlling for the statistical predictors. Moreover, it subsumes the predictive ability of the latter with respect to future growth in *EBEI*. Importantly, statistical predictors of growth seem to be "fitted" to a specific earnings measure. Namely, statistically predicted growth in *OI* (*EBEI*) has no power in predicting growth in *EBEI* (*OI*). The above evidence, combined, suggests that while it is possible to predict future realized growth in earnings statistically, the statistical growth measures need to be "fitted" to a specific earnings metric and they do not perform as well as the implied growth at predicting growth in bottom-line earnings. The implied growth measure, on the other hand, provides universal predictive ability, regardless of earnings definition, and contains information beyond simple statistical predictors.

Cross-Sectional Determinants of Return Predictability Relative to GLS

Results in Table 3 show that our COE measure on average surpasses the benchmark COE measures in predicting future returns over a broad cross-section of firms. In this subsection we explore the cross-sectional variation in the relative predictive ability of our measure. Specifically, we focus on our measure's performance relative to the best performing benchmark—COE from the GLS model (r_{GLS}).[30]

We expect to see the largest difference in the two measures' performance in the subsample of firms where the two measures differ from each the other most. Accordingly, we sort firms into portfolios based on absolute values of differences between our measure and r_{GLS}. To evaluate the relative performance of the two measures, we then estimate firm-specific regressions of future realized returns on the COE measures within these portfolios.

Panel A of Table 6 contains regression results. Our measure has significant predictive ability with respect to future returns across all sample partitions—the slope coefficient for r_{SE} is statistically significant at least at the 10% level. In contrast, the slope coefficient for r_{GLS} turns statistically insignificant in the top two quintiles, where r_{GLS} is most different from our measure. Relative to our measure, r_{GLS} performs the worst in quintile five, where the absolute deviation between our measure and r_{GLS} is the highest.

[30] In this subsection, we focus on COE measures adjusted for predictable forecast errors.

Next, we explore the determinants of relatively poor performance of the GLS measure in the quintile with the highest deviation from our measure. There are two main reasons why our measure outperforms r_{GLS} in that quintile. First, our growth assumptions may be relatively more accurate if either the key assumption in the GLS model—firms' ROE convergence to the industry average—is violated, or the terminal growth in residual earnings is not equal to zero. Second, risk characteristics may play a relatively more important role in COE estimation in that quintile, which would be the case if these characteristics are more salient for this subsample, i.e. they are further away from sample averages.

Following the above line of reasoning we calculate by-quintile averages of the following variables. First, to reflect how the firm is different from its industry in terms of its growth prospects, we calculate absolute deviations of firm's growth drivers (R&D expenses over sales, analysts' predicted long term growth, and the current level of ROE) from respective industry averages. Second, to reflect how the implied terminal growth rate is different from zero, we calculate absolute value of our implied growth estimate. Third, to capture the salience of risk characteristics, we calculate absolute deviation of risk drivers (CAPM beta, size, book-to-market ratio, and past one-year stock returns) from respective sample averages. In addition, we report an absolute deviation from the industry average for a growth variable not included into our COE estimation—sales growth over the past five years.

Panel B of Table 6 reports averages of by-year variable means by quintiles of absolute difference in r_{GLS} and r_{SF}. The last two columns report average differences between the top and the bottom quintiles and the corresponding Fama-MacBeth *t*-

statistics with the Newey-West autocorrelation adjustment. As expected, we observe that all growth drivers' deviations from industry averages are significantly higher for quintile five, where our measure is the most different from GLS, compared to quintile one, where the two measures are the closest. The deviation in R&D expenses, however, is higher in quintile four. Also as expected, the deviation of implied growth from zero is the highest in the fifth quintile. Finally, the risk characteristics of the firms in the fifth quintile are furthest away from the sample means, with the book-to-market ratio standing out in terms of the relative magnitude of absolute distance to the mean.

Overall, we uncover several cross-sectional determinants of our measure's relative performance compared to GLS. We find that our measure works relatively better for firms that are further from their industry in terms of profitability, forecasted long-term growth, and past sales growth, or further away from the average firm in terms of size, book-to-market ratio, CAPM beta, or past returns. These findings may guide future empirical research in the choice of an appropriate COE measure.

Comparison with ETSS: Average COE and Growth Rate

One of the main findings in ETSS is that their average COE estimate is significantly higher than average implied COE estimates from prior studies. As discussed in Section 2, our average COE and long-term growth estimates may deviate from those in ETSS because our model explicitly incorporates the observable risk and growth drivers. Next, we compare the average of by-year means of the COE (expected earnings growth) produced by our model to ETSS' estimates.[31] The (untabulated) results suggest that our model yields notably lower COE and earnings growth estimates. When using the ETSS model, the average COE is 11.7% (9.7%) and growth rate is 9.7% (7.4%) before (after) correction for analyst forecast errors. The corresponding values produced by our model are 9% (7.6%) and 6.7% (5.2%). Both our and ETSS' growth estimates are greater than the average historical earnings growth rate for the US market of around 3.2% per annum, with our estimates being closer to the historical rate.[32]

Using the average risk-free rate (proxied by five-year Treasury bond yield) of 7.22% for our sample period, the average implied risk premium from ETSS model is 4.43% (2.50%) compared to 2.50% (0.34%) from our model before (after) correction for analyst forecast errors.[33] Although the average risk premium from our model is significantly lower than the historical premium based on realized returns, it is consistent with theoretically derived equity risk premia (Mehra and Prescott 1985). Moreover, lower estimates of COE are consistent with the finding in Hughes et al. (2009) that, when expected returns are stochastic, the implied COE is lower than the expected return.[34] These results, however, need to be interpreted with caution given the lack of reliable benchmarks of market risk premia, against which model estimates can be judged.

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[31] To derive growth in earnings using growth in residual earnings, we use the formula derived in the appendix in ETSS. Since we assume a constant future dividend payout while ETSS assume constant future dividends, we adjust the formula to make it consistent with our assumption.

[32] The estimate of the average historical rate is based on the data for aggregate nominal earnings of the S&P 500 firms from 1871 to 2009 provided by Robert Shiller at http://www.econ.yale.edu/~shiller/data/ie_data.xls.

[33] Risk premia are often measured relative to the rate on one-month Treasury bills. Based on this measure of the risk free rate, the average implied risk premium from ETSS model is 5.82% (3.89%) compared to 3.89% (1.17%) from our model before (after) correction for analyst forecast errors.

[34] Hughes et al. (2009) provide a ball-park estimate of the difference between expected returns and implied cost of capital of 2.3%. They note that the actual difference can be larger.

5. Robustness Tests and Additional Analyses

Easton and Monahan Tests of Construct Validity

A valid COE proxy should be positively associated with future *expected* stock returns. Our validation tests based on realized returns implicitly assume that realized stock returns on average are equal to expected returns. This assumption may not hold in finite data samples. For example, Elton (1999) argues that historical realized returns deviate from expected returns over long periods of time due to non-cancelling cash flow or discount rate shocks. To address this limitation, Easton and Monahan (2005) propose a method to control for future cash flow and discount rate shocks in realized returns – COE regressions.[35]

In this subsection, we conduct the Easton and Monahan tests for our implied COE measures. The tests consist of two parts. The first part involves regressing the log of one-year-ahead stock returns on the log of the COE measure (proxy for expected return) and the logs of contemporaneous cash flow and discount rate news proxies. The coefficient on the valid COE measure should not be statistically different from one. The second part involves calculating implied measurement errors for the COE estimates, using a modified Garber and Klepper (1980) approach.

Table 7 reports average by-year coefficients of Easton and Monahan regressions, where Panel A (Panel B) pertains to unadjusted (adjusted) COE measures. In Panel A, regression coefficients for all COE measures are significantly negative, suggesting that

[35] The Easton and Monahan (2005) test has proven to be a high bar for estimating construct validity of COE measures. Most conventional implied COE measures are negatively correlated with realized stock returns after controlling for cash flow and discount rate news, and have significant measurement errors.

all unadjusted measures are invalid. In contrast, Panel B reports that two COE measures adjusted for analyst forecast errors—our measure, r_{SF}, and r_{PEG}—have regression coefficients statistically indistinguishable from one. One caveat in interpreting these results is that COE proxies as well as cash flow and discount rate news proxies can be measured with error. In case these errors are correlated, the regression coefficients can no longer be interpreted at the face value.

The second part of the Easton and Monahan tests addresses the aforementioned issue of correlated measurement errors. Specifically, Easton and Monahan construct a statistic for the extent of the measurement error in the COE proxy that controls for correlation in measurement errors across the three variables in the regression. We report this statistic ("modified noise variable") in the last column of both Panels A and B in Table 7. The results show that our implied COE measure, r_{SF}, has the lowest measurement error across all unadjusted (adjusted) COE measures.

To summarize, Easton and Monahan tests of construct validity suggest the following. First, the tests unambiguously establish construct validity of our COE measure adjusted for analyst forecast errors, while our unadjusted COE measure exhibits a negative association with future expected returns (possibly due to correlated measurement errors in cash flow and discount rate news proxies). Second, among all COE measures adjusted (unadjusted) for analyst forecast errors, our measure exhibits the lowest degree of measurement error.

Future Realized Earnings Growth and Survivorship Bias

The growth rates used in validation of implied growth measures are estimated only for the firms that survive over the $[t-1, t+8]$ period. Next, we explore the effects that sample attrition may have on our implied growth validation tests.

Panel A of Figure 3 plots percentage of firms for which realized growth in either *EBEI* or *OI* is unavailable. Clearly, the percentage of firms leaving the sample ("non-survivors") is higher within higher quintiles of implied growth. For example, growth in *OI* cannot be estimated for 51% (31%) of firms within the highest (lowest) quintile of unadjusted implied growth.[36] To the extent that "non-survivors" would have had lower realized growth rates, the growth estimates are systematically biased upwards, and the degree of bias is higher for the higher quintiles of implied growth.

To investigate the potential extent of the bias, we first classify "non-survivors" by reasons for leaving the sample. For that purpose, we use CRSP classification of stock delistings from exchanges. The main categories of delistings are: mergers or stock exchanges, bad performance (such as bankruptcy or liquidation), and other miscellaneous reasons (such as switching to a different exchange or going private). The bad performance-related category is classified following Shumway (1997). Panel B of Figure 3 reports percentage of firms delisted within eight years following the implied growth estimation by quintiles of implied growth measures.[37] The evidence from the figure suggests that the main reason behind sample attrition is related to mergers. Mergers are

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[36] The sample attrition for growth in *EBEI* is higher than for *OI* due to more frequent negative growth base (growth in EBEI cannot be calculated when four-year cum-dividend earnings for $[t-1, t+4]$ are negative).

[37] Note, that the percentages of delisted firms do not add up to the total percentage of "non-survivors" from Panel A of Figure 3. The difference is due to the cases where earnings are available, but growth cannot be computed due to negative four-year cum-dividend earnings for $[t-1, t-4]$.

also the biggest source of the higher sample attrition for firms in the higher implied growth quintiles. For example, the difference in delisting percentage between the top and the bottom quintiles of unadjusted (adjusted) implied growth is 7.6% (8.8%) for merger-related delistings versus 0.7% (3%) for bad performance-caused delistings.

Using the above classification results, we perform a robustness check by substituting missing realized earnings growth for non-surviving firms with plausible ad-hoc growth estimates. Arguably, a firm that goes bankrupt has a relatively lower realized earnings growth compared to a firm that undergoes a merger. Accordingly, as our first robustness check we substitute the missing [t 4, t 8] earnings for firms with bad performance-related delistings with a negative book value of equity at t+4. Such substitution assumes that equity becomes entirely worthless after performance delisting, which is a conservative assumption. We re-run the analyses in Table 4, Panels B and C using substituted growth rates. The results are presented in Table 8, Panel A. Both the unadjusted and adjusted implied growth is positively and significantly associated with future realized growth in *OI*, while the unadjusted implied growth is positively associated with future realized growth in *EBEI*.

Next, we make an additional assumption of a zero growth rate for firms delisting due to mergers. Note, that this is a conservative assumption. Zero represents the 26th (34th) percentile of *OI* (*EBEI*) growth distribution. Regression results after performing this additional substitution are presented in Panel B of Table 8. Despite the conservative growth assumptions, unadjusted (adjusted) implied growth rate quintiles are positively and significantly associated with the realized growth in *EBEI* (*OI*).

Overall, the survivorship bias is a serious concern for the implied growth validity tests. However, robustness tests suggest that our results are unlikely entirely explained by such bias.

Implied COE Based on Aggregate Earnings

Our implied COE measure is different from benchmark measures (r_{GLS}, r_{CT}, and r_{PEG}) on a number of dimensions, including the underlying valuation model, forecast horizon, and earnings aggregation. To confirm that endogenously estimated terminal growth is the main source of our measure's superior return predictive ability, we construct an implied COE measure that is similar to our measure on all dimensions, except assumed terminal growth. Namely, we calculate r_{ZERO} as an internal rate of return from equation (2), assuming zero growth in four-year cum-dividend residual earnings (i.e. $G_i = 1$). We then replicate the validation tests summarized in Figure 1 and Table 3 using r_{ZERO}. The portfolio results (untabulated) suggest that r_{ZERO} on average performs better than the benchmark COE measures, but somewhat worse than our measure in predicting future returns. Using earnings forecasts adjusted for predictable errors, the average difference in one-year-ahead returns between the stocks in the top and the bottom quintiles of r_{ZERO} is 8.43%, compared to 9.45% for our measure. However, at the firm level, our measure dominates r_{ZERO}. In the firm-level regressions of one-year-ahead returns on COE measures, the slope on r_{ZERO} is 0.45 (significant at the 10% level), compared to 1.45 (significant at 1% level) for our measure. When both measures are included in the regression, r_{ZERO} is no longer statistically significant, while our measure is significant at the 1% level.

To further confirm that the superior predictive ability of our measure comes from a more accurately estimated terminal growth, we perform analyses similar to those reported in Table 6 for r_{GLS}. Namely, we partition the sample based on the absolute value of our implied growth (to capture deviation from the zero growth assumed for r_{ZERO}). In untabulated results, we find that r_{ZERO} does not predict future returns in the top quintile with the highest absolute implied growth (the average slope estimate is 0.17 with a *t*-statistic of 0.98), whereas our measure remains significantly associated with future returns (the average slope estimate is 1.47 with a *t*-statistic of 3.41).

6. Conclusion

The implied COE has recently gained significant popularity in accounting (and increasingly in finance) research. Despite its theoretical and practical appeal, the implied COE, as any other valuation model output, is only as good as the model inputs.[38] In particular, the implied COE is sensitive to the assumption about the expected earnings growth rate. In this study, we propose a method of estimating COE that avoids relying on ad-hoc assumptions about the long-term growth by estimating growth rates *implied by the data*.

Our estimation method follows Easton, Taylor, Shroff, and Sougiannis (2002), who simultaneously estimate sample averages for COE and expected growth in earnings.

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[38] The two other commonly used approaches to estimating COE (multiplying historical estimates of factor risk premia on historical factor loadings, and using ex-post realized returns) have their own merits and demerits. The first, approach is problematic given the ongoing debate about the appropriate asset pricing model and substantial measurement errors in the estimates of factor risk premia and risk loadings (Fama and French 1997). The second approach requires a very large sample spanning dozens of years (which is often not available to the researcher), since more risky stocks can underperform less risky stocks for multiple consecutive years (Elton 1999). Also, ex-post returns approach does not allow estimating the (ex-ante) COE in real time necessary for capital budgeting and other decisions.

The two assumptions that allow us to estimate firm-specific COE and expected growth are that each company has a unique risk-growth profile that can be proxied by observable characteristics, and that parsimonious measures of risk and growth should allow minimal deviations from such risk-growth profiles.

Our paper is related to earlier work by Huang et al. (2005), who use ETSS' method to estimate firms' COE and growth based on the *time series* of monthly stock prices and earnings forecasts. Our method differs from that proposed by Huang et al. along several dimensions. First, their method assumes that a firm's risk exposure and expected earnings growth do not change over the estimation period (36 months), which limits the practical appeal of the resulting measures (i.e., they cannot be used to examine changes in risk over short horizons). In contrast, we provide point-in-time COE estimates. Second, their estimation pairs monthly stock prices with annual book values of equity, which implicitly assumes that the book value of equity does not change within a given fiscal year. Our method relies on annual stock prices corresponding to annual book values of equity. Finally, by using monthly analyst forecasts and stock prices, their method assumes that forecasts and prices are simultaneously updated to reflect new information on a timely basis, which is inconsistent with prior research documenting significant sluggishness in analyst forecasts (Guay et al. 2005).

We validate our COE and growth estimates by examining their association with future stock returns and realized earnings growth, respectively. We find that our COE measure has a significant out-of-sample predictive ability with respect to future returns, which subsumes the predictive ability of other commonly used COE measures. At the same time, our expected growth measure is significantly associated with the future long-term earnings growth. Therefore, both the COE and the long-term growth measures appear to have construct validity.

Appendix A

Simultaneous Estimation of COE and Long-Term Growth

In this appendix, we derive expressions for implied COE and growth. Combining equation (3b) with assumption (4) from Section 2 yields the following system of equations:

$$\begin{cases} \underset{\varepsilon_R^i,\varepsilon_G^i,\varepsilon^i,\gamma_0,\gamma_1,\lambda_R,\lambda_G}{Min} \sum_i w_1^i(\varepsilon_R^i)^2 + w_2^i(\varepsilon_G^i)^2 \\ s.t.\ X_{cT}^i / B_0^i = \gamma_0 + \gamma_1 MB^i + \varepsilon^i \\ \varepsilon^i = (G^i - \overline{G})(1 - MB^i) + (R^i - \overline{R})MB^i \\ \gamma_0 = \overline{G} - 1 \\ \gamma_1 = \overline{R} - \overline{G} \\ R^i = \overline{R} + \lambda_R x_R^i + \varepsilon_R^i \\ G^i = \overline{G} + \lambda_G x_G^i + \varepsilon_G^i \end{cases} \tag{A1}$$

Next, we simplify the problem in (A1) so that it can be solved using standard regression analysis. Substituting the expressions for ε^i, R^i, and G^i into the second equation in (A1) and defining $\nu^i = \varepsilon_G^i + (\varepsilon_R^i - \varepsilon_G^i)MB^i$, we express the above system of equations as follows:

$$\begin{cases} \underset{\varepsilon_R^i,\varepsilon_G^i,\nu^i,\gamma_0,\gamma_1,\lambda_R,\lambda_G}{Min} \sum_i w_1^i(\varepsilon_R^i)^2 + w_2^i(\varepsilon_G^i)^2 \\ \text{s.t.} \quad X_{cT}^i / B_0^i = \gamma_0 + \gamma_1 MB^i + \lambda_R MB^i x_R^i + \lambda_G (1 - MB^i) x_G^i + \nu^i \\ \nu^i = \varepsilon_G^i + (\varepsilon_R^i - \varepsilon_G^i)MB^i \end{cases} \tag{A2}$$

Substituting $\varepsilon_G^i = (\varepsilon_R^i MB^i - \nu^i)/(MB^i - 1)$ from the last equation, we obtain

$$\begin{cases} \underset{\varepsilon_R^i,\nu^i,\gamma_0,\gamma_1,\lambda_R,\lambda_G}{Min} \sum_i w_1^i(\varepsilon_R^i)^2 + w_2^i((\varepsilon_R^i MB^i - \nu^i)/(MB^i - 1))^2 \\ \text{s.t.} \quad X_{cT}^i / B_0^i = \gamma_0 + \gamma_1 MB^i + \lambda_R MB^i x_R^i + \lambda_G (1 - MB^i) x_G^i + \nu^i \end{cases} \tag{A3}$$

Finally, substituting the expression for ε_R^i that satisfies the first order conditions, $\varepsilon_R^i = w_2^i MB^i \nu^i / (w_1^i (MB^i - 1)^2 + w_2^i (MB^i)^2)$, we obtain the following weighted least square regression:

$$\begin{cases} \underset{v^i,\gamma_0,\gamma_1,\lambda_R,\lambda_G}{Min} \sum_i \frac{w_1^i w_2^i (v^i)^2}{w_1^i (1-MB^i)^2 + w_2^i (MB^i)^2} \\ \text{s.t.} \quad X_{cT}^i / B_0^i = \gamma_0 + \gamma_1 MB^i + \lambda_R MB^i x_R^i + \lambda_G (1-MB^i) x_G^i + v^i \end{cases} \tag{A4}$$

Combining equations (A4) with the above expressions for $\overline{R}$, $\overline{G}$, ε_R^i, ε_G^i, R^i, and G^i, we have the following WLS regression and equations that uniquely determine firm COE and expected growth rate:

$$\begin{cases} \underset{v^i,\gamma_0,\gamma_1,\lambda_R,\lambda_G}{Min} \sum_i \frac{w_1^i w_2^i (v^i)^2}{w_1^i (1-MB^i)^2 + w_2^i (MB^i)^2} \\ s.t. \ X_{cT}^i / B_0^i = \gamma_0 + \gamma_1 MB^i + \lambda_R MB^i x_R^i + \lambda_G (1-MB^i) x_G^i + v^i \\ \overline{G} = \gamma_0 + 1 \\ \overline{R} = \gamma_1 + \gamma_0 + 1 \\ \varepsilon_R^i = v^i \frac{w_2^i MB^i}{w_1^i (MB^i - 1)^2 + w_2^i (MB^i)^2} \\ \varepsilon_G^i = v^i \frac{w_1^i (1-MB^i)}{w_1^i (MB^i - 1)^2 + w_2^i (MB^i)^2} \\ R^i = \overline{R} + \lambda_R x_R^i + \varepsilon_R^i \\ G^i = \overline{G} + \lambda_G x_G^i + \varepsilon_G^i \end{cases} \tag{A5}$$

The first equation specifies the weights $w^i = w_1^i w_2^i / (w_1^i (1-MB^i)^2 + w_2^i (MB^i)^2)$ that should be used in the WLS regression $X_{cT}^i / B_0^i = \gamma_0 + \gamma_1 MB^i + \lambda_R MB^i x_R^i + \lambda_G (1-MB^i) x_G^i + v^i$. Having found the intercept, slopes, and residuals from the regression, the third and the fourth equations can be used to obtain the sample mean R and G, the fifth and the sixth equations can be used to calculate the components of R^i and G^i due to unobservable risk and growth factors, and finally the last two equations can be used to calculate the firm COE and growth rate.

Comparison of between Our Model and ETSS

Recall that our minimization problem outlined in Section 2 is specified as:

$$\begin{cases} \underset{\overline{R},\overline{G},\lambda_R,\lambda_G,\varepsilon_R^i,\varepsilon_G^i}{Min} \sum_i w_1^i(\varepsilon_R^i)^2 + w_2^i(\varepsilon_G^i)^2 \\ R^i = \overline{R} + \boldsymbol{\lambda}_\mathbf{R}\,'\mathbf{x}_\mathbf{R}^\mathbf{i} + \varepsilon_R^i \\ G^i = \overline{G} + \boldsymbol{\lambda}_\mathbf{G}\,'\mathbf{x}_\mathbf{G}^\mathbf{i} + \varepsilon_G^i \end{cases} \tag{4}$$

Estimating regression (3b) in ETSS implies a different minimization problem. Because OLS minimizes the sum of squared residuals, the deviations of R^i and G^i from the sample means are jointly minimized in the following way:

$$\begin{gathered} \underset{\overline{R},\overline{G},\varepsilon^i}{Min} \sum_i (\varepsilon_G^i(1-MB^i) + \varepsilon_R^i MB^i)^2 \\ \begin{cases} R^i = \overline{R} + \varepsilon_R^i \\ G^i = \overline{G} + \varepsilon_G^i \end{cases} \end{gathered} \tag{A6}$$

The key difference between ETSS' and our minimization problems is that ETSS' minimization function (A6) does not increase even as ε_R^i and ε_G^i go to infinity as long as their linear combination, $\varepsilon_G^i(1-MB^i) + \varepsilon_R^i MB^i$, remains the same. In contrast, our loss function (4) always increases in the magnitude of ε_R^i and ε_G^i. Mathematically, our minimization function is positive definite while that in ETSS is positive semi-definite.[39] The assumption of a positive definite function is a standard assumption in the definition of a loss function. We find that the minimization of any positive definite quadratic function of ε_R^i and ε_G^i is sufficient to uniquely identify firm-specific R and G (the proof is available from the authors upon request).

[39] A quadratic function $w_1^i(\varepsilon_R^i)^2 + w_2^i(\varepsilon_G^i)^2 + w_3^i\varepsilon_R^i\varepsilon_G^i$ is positive (semi-)definite if it is positive (non-negative) for any non-zero argument, $\varepsilon_R^i\varepsilon_G^i \neq 0$, which holds if and only if $w_1^i > 0\,(\geq 0)$ and $4w_1^iw_2^i - (w_3^i)^2 > 0\,(\geq 0)$.

Appendix B

Benchmark COE Measures

Implied COE from Claus and Thomas (2001), r_{CT}, is an internal rate of return from the following valuation equation:

$$P_0 = B_0 + \sum_{\tau=1}^{4} \frac{E_\tau - r_{CT} B_{\tau-1}}{(1+r_{CT})^t} + \frac{E_5 - r_{CT} B_4}{(r_{CT} - g_{CT})(1+r_{CT})^4} \qquad (r_{CT})$$

where P_0 is the stock price as of June of year t+1 from *I/B/E/S*; B_0 is the book value of equity at the end of year t from *Compustat* divided by the number of shares outstanding from *I/B/E/S;* E_1 and E_2 are one- and two-year-ahead consensus earnings per share forecasts from *I/B/E/S* reported in June of year $t+1$; E_3, E_4 and E_5 are three-, four- and five-year-ahead earnings per share forecasts computed using the long-term growth from *I/B/E/S* as: $E_3 = E_2(1+Ltg)$, $E_4 = E_3(1+Ltg)$, and $E_5 = E_4(1-Ltg)$; B_τ is the expected per-share book value of equity for year τ estimated using the clean surplus relation ($B_{t+1} = B_t + E_{t+1} - d_{t+1}$); g_{CT} is the terminal growth calculated as the ten-year Treasury bond yield minus three percent.[40]

Implied COE from Gebhardt et al. (2001), r_{GLS}, is an internal rate of return from the following valuation equation:

$$P_0 = B_0 + \sum_{\tau=1}^{11} \frac{(ROE_\tau - r_{GLS})B_{\tau-1}}{(1+r_{GLS})^t} + \frac{(IndROE - r_{GLS})B_{11}}{r_{GLS}(1+r_{GLS})^{11}} \qquad (r_{GLS})$$

where ROE_τ is expected future return on equity calculated as earnings per share forecast (E_τ) divided by per share book value of equity at the end of the previous year ($B_{\tau-1}$); ROE_1 and ROE_2 are calculated using one- and two-year-ahead consensus earnings per share forecasts from *I/B/E/S* reported in June of year $t+1$; ROE_3 is computed by applying the long-term growth rate from *I/B/E/S* to the two-year-ahead consensus earnings per share forecast; beyond year $t-3$, ROE is assumed to linearly converge to industry median ROE (*IndROE*) by year $t-12$.

Implied COE from Gode and Mohanram (2003), r_{PEG}, is calculated as:

$$r_{PEG} = \sqrt{\frac{E_1}{P_0}(r_{PEG})}, \qquad g_2 = \frac{(E_2 / E_1 - 1) + Ltg}{2} \qquad (r_{PEG})$$

where P_0 is the stock price as of June of year $t+1$ from *I/B/E/S*; E_1 and E_2 are one- and two-year-ahead consensus earnings per share forecasts from *I/B/E/S* reported in June of year $t+1$; *Ltg* is the long-term earnings growth forecast from *I/B/E/S* reported in June of year $t+1$. This measure is a modified version of the Easton (2004) PEG measure, which assumes $g_2 - E_2/E_1$.

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[40] To avoid using very high terminal growth in years with high risk-free rate we winsorize g_{CT} at the 3% level. When we do not winsorize g_{CT}, r_{CT} performs worse and none of the inferences regarding our COE measure change.

References

Botosan, C., and M. Plumlee. 2005. Assessing alternative proxies for the expected risk premium. *The Accounting Review* 80 (1): 21-53.

Carhart, M. 1997. On persistence in mutual fund performance. *Journal of Finance* 52: 57-82.

Chan, L.K.C, J. Karceski, and J. Lakonishok. 2003. The level and persistence of growth rates. The Journal of Finance 58 (2): 643-684.

Chava, S., and A. Purnanadam. 2010. Is default risk negatively related to stock returns? Review of Financial Studies 23 (6): 2523-2559.

Claus, J., and J. Thomas. 2001. Equity premia as low as three percent? Evidence from analysts' earnings forecasts for domestic and international stock market. *Journal of Finance* 56 (5): 1629-66.

Damodaran, A. 2002. Damodaran on valuation. Second Edition. John Wiley & Sons, Inc. New York.

Dhaliwal, D., L. Krull, O. Li, and W. Moser. 2005. Dividend taxes and implied cost of capital. *Journal of Accounting Research* 43, 675–715.

Easton, P. 2004. PE ratios, PEG ratios, and estimating the implied expected rate of return on equity capital. *The Accounting Review* (January): 73-95.

Easton, P. 2006. Use of forecasts of earnings to estimate and compare cost of capital across regimes. *Journal of Business Finance and Accounting* 33 (3) 374-394.

Easton, P. 2007. Estimating the cost of capital implied by market prices and accounting data. *Foundations and Trends in Accounting* 2 (4) 241-346.

Easton, P., and G. Sommers. 2007. Effect of analysts' optimism on estimates of the expected rate of return implied by earnings forecasts. *Journal of Accounting Research* 45 (5): 983-1015.

Easton, P., and S. Monahan. 2005. An evaluation of accounting-based measures of expected returns. *The Accounting Review* 80 (2): 501-538.

Easton, P., G. Taylor, P. Shroff, and T. Sougiannis. 2002. Using forecasts of earnings to simultaneously estimate growth and the rate of return on equity investment. *Journal of Accounting Research* 40 (3): 657-676.

Elton, J. 1999. Expected return, realized return and asset pricing tests. *Journal of Finance* 54: 1199-1220.

Fairfield, P. M. 1994. P/E, P/B and the present value of future dividends. *Financial Analysis Journal* July–Aug: 23–31.

Fama, E., and J. MacBeth. 1973. Risk, return, and equilibrium: empirical tests. *Journal of Political Economy* 81: 607–636.

Fama, E., and K. French. 1992. The cross-section of expected stock returns. *Journal of Finance* 47 (2): 427-465.

Fama, E., and K. French. 1993. Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics* 33 (1): 3-56.

Fama, E., and K. French. 1995. Size and book-to-market factors in earnings and returns. *Journal of Finance* 50 (1): 131-155.

Fama, E., and K. French. 1997. Industry costs of equity. *Journal of Financial Economics* 43 (2): 153-193.

Feltham, G., and J. Ohlson. 1995. Valuation and clean surplus accounting for operating and financial activities. *Contemporary Accounting Research* 11 (2): 689-731.

Francis, J., R. LaFond, P. Olsson, and K. Schipper. 2004. Costs of capital and earnings attributes. *The Accounting Review* 79, 967–1011.

Gao, Z. and W. Wu, 2010. Predicting future growth: can anything beat analysts' long-term growth forecasts? Working paper, Lancaster University and Arizona State University.

Garber, S. and S. Klepper, 1980. "Administrative pricing" or competition coupled with errors of measurement? *International Economic Review* 21: 413-435.

Gebhardt, W., C. Lee, and B. Swaminathan. 2001. Towards an ex-ante cost of capital. *Journal of Accounting Research* 39 (1): 135-176.

Gode, D. and P. Mohanram. 2003 Inferreng the cost of capital using the Ohlson-Juettner model. *The Review of Accounting Studies*, 8, 399-431.

Gode, D. and P. Mohanram. 2009. Improving the Relationship between Implied Cost of Capital and Realized Returns by Removing Predictable Analyst Forecast Errors. Working paper, New York University and Columbia University. The paper is available at http://w4.stern.nyu.edu/emplibrary/092208_gode-mohanram.pdf.

Guay, W., S. Kothari , and S. Shu. 2005. Properties of implied cost of capital using analysts' forecasts. Working paper, University of Pennsylvania, Massachusetts Institute of Technology, and Boston College.

Hail, L. and C. Leuz. 2006. International differences in the cost of equity capital: Do legal institutions and securities regulation matter?. *Journal of Accounting Research* 44, 485–532.

Hamada, R. 1972. The effect of the firms' capital structure on the systematic risk of common stocks. *Journal of Finance* 27 (2): 435-452.

Hou, K., M. A. van Dijk, and Y. Zhang. 2010. The implied cost of capital: a new approach. Working paper.

Hribar, P. and N. Jenkins. 2004. The effect of accounting restatements on earnings revisions and the estimated cost of capital. Review of Accounting Studies 9, 337–356.

Huang, R., R. Natarajan, and S. Radhakrishnan. 2005. Estimating firm-specific long-term growth rate and cost of capital. Working paper, University of Texas at Dallas.

Hughes, J. Liu, and J. Liu. 2009. On the relation between expected returns and implied cost of capital. *Review of Accounting Studies* 14: 246-259.

Hughes, J., J. Liu, and W. Su. 2008. On the Relation between Predictable Market Returns and Predictable Analyst Forecast Errors. *Review of Accounting Studies* 13: 266-291.

Jagannathan, R., and Z. Wang. 1996. The conditional CAPM and the cross-section of expected returns. *Journal of Finance* 51: 3-53.

Larocque, S. 2010. Analysts forecasts errors and cost of equity capital estimates. Working paper, University of Notre Dame.

Lee, C., D. Ng, and B. Swaminathan, 2009, "Testing international asset pricing models using implied costs of capital," *Journal of Financial and Quantitative Analysis* 44, 307-335.

Lettau, M., and S. Ludvigson. 2001. Consumption, aggregate wealth, and expected stock returns. *Journal of Finance* 56 (3): 815-849.

Mehra, R, and E. C. Prescott. 1985. The equity premium: a puzzle. *Journal of Monetary Economics* 15 : 145–161.

Merton, R. 1973. An intertemporal capital asset pricing model. *Econometrica* 41 (5): 867–887.

Newey, W., and K. West. 1987. A simple, positive semi-definite heteroscedasticity and autocorrelation consistent covariance matrix. *Econometrica* 55: 703-708.

Ogneva, M., K. R. Subramanyam, and K. Raghunandan. 2007. Internal control weakness and cost of equity: Evidence from SOX section 404 disclosures. *The Accounting Review* 82 (October), 1255–1298.

Ohlson, J. 1995. Earnings, book values, and dividends in security valuation. *Contemporary Accounting Research* 11 (2): 661-687.

Ohlson, J. and B. Juettner-Nauroth. 2005. Expected EPS and EPS growth as determinants of value. *Review of Accounting Studies* 10(2–3): 349–365.

Pastor, L., M. Sinha, and B. Swaminathan, 2008, "Estimating the Intertemporal Risk-Return Tradeoff Using the Implied Cost of Capital", *The Journal of Finance* 63(6), 2859-2897

Penman, S. 1996. The articulation of price-earnings ratios and market-to-book ratios and the evaluation of growth. Journal of Accounting Research 34 (2): 235-259.

Penman, S. 2009. Financial Statement Analysis and Security Valuation. Fourth Edition. McGraw-Hill Irwin, New York.

Penman, S., Zhang, X. 2002. Accounting Conservatism, the Quality of Earnings, and Stock Returns. *The Accounting Review* 77: 237-264.

Petersen, M. 2009. Estimating standard errors in finance panel data sets: Comparing approaches. *Review of Financial Studies* 22 (1): 435-480.

Petkova, R., 2006. Do the Fama–French factors proxy for innovations in predictive variables? *Journal of Finance* 61, 581–612.

Pratt, S. P. and A.V. Niculita. 2007. Valuing a Business: The Analysis and Appraisal of Closely Held Companies. Fifth edition. McGraw-Hill.

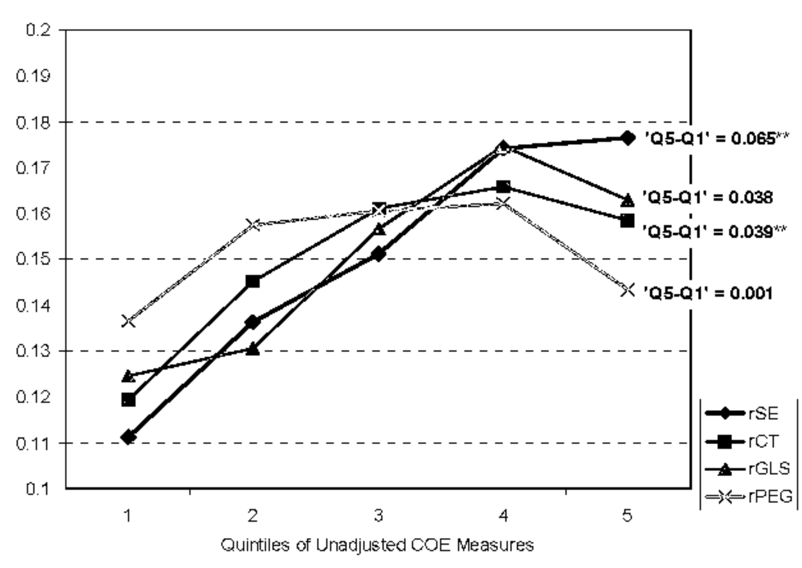
Shumway, T. 1997. The delisting bias in CRSP data. *Journal of Finance* 52: 327 340.

Whalen, J., S. Baginski, M. Bradshaw. 2010. Financial reporting, financial statement analysis, and valuation. Seventh Edition. South-Western Centage Learning, Mason.

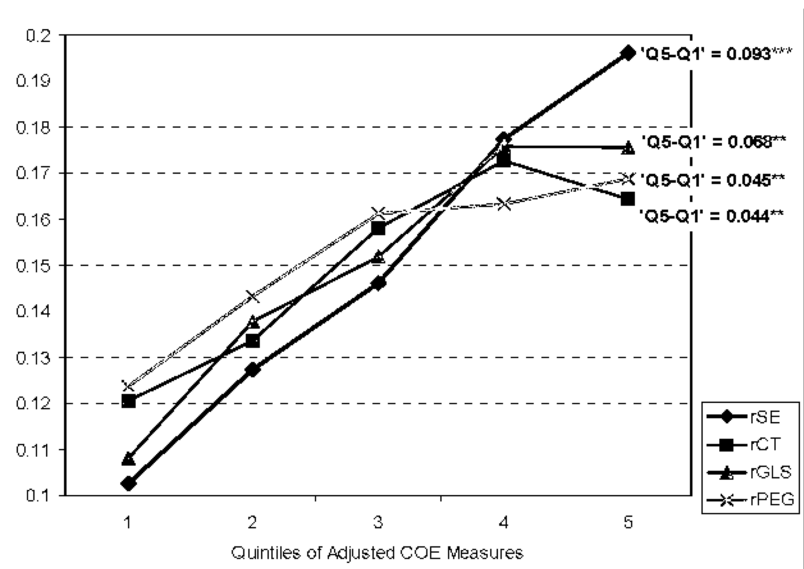
Zhang, X. J. 2000. Conservative Accounting and Equity Valuation. *Journal of Accounting and Economics* 29: 125-149.

Figure 1. Future Realized Returns for COE Portfolios

Panel A. Average Returns by Quintiles of Unadjusted COE Measures



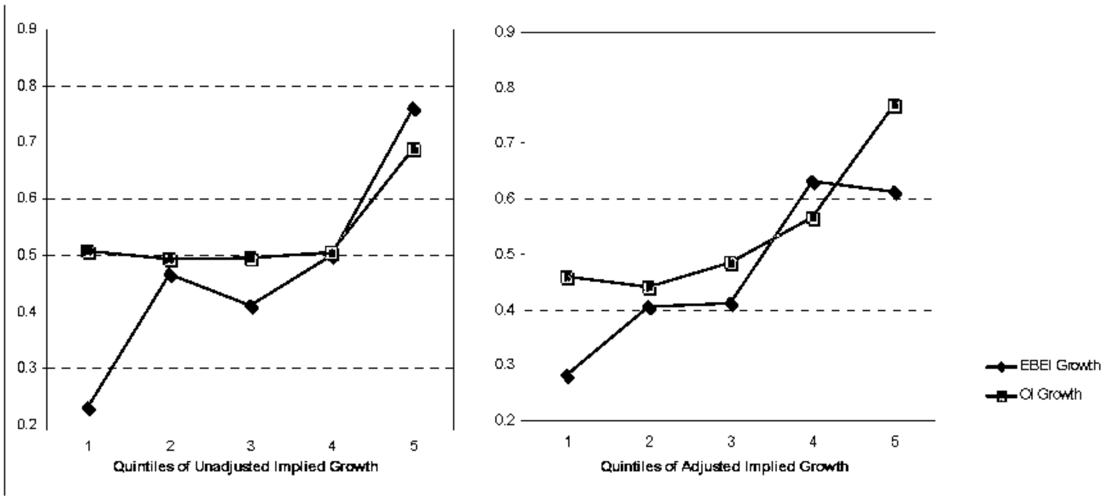
Panel B. Average Returns by Quintiles of Adjusted COE Measures



***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

The figure plots average one-year-ahead buy-and-hold returns for equal-weighted quintile portfolios based on COE measures for a sample of 50,636 firm-year observations from 1980 to 2007. r_{SE} is the COE measure based on our model, r_{CT} is the COE measure based on the Claus and Thomas (2001) model, r_{GLS} is the COE measure based on the Gebhardt et al. (2001) model, r_{PEG} is the COE measure based on the PEG model (Gode and Mohanram 2003). Unadjusted (adjusted) COE are based on raw analyst earnings forecasts (forecasts adjusted for predictable errors). 'Q5-Q1' refers to hedge returns on portfolios long (short) in quintile five (one) stocks. Statistical significance of hedge returns is based on Fama-MacBeth *t*-statistics with the Newey-West adjustment for autocorrelation.

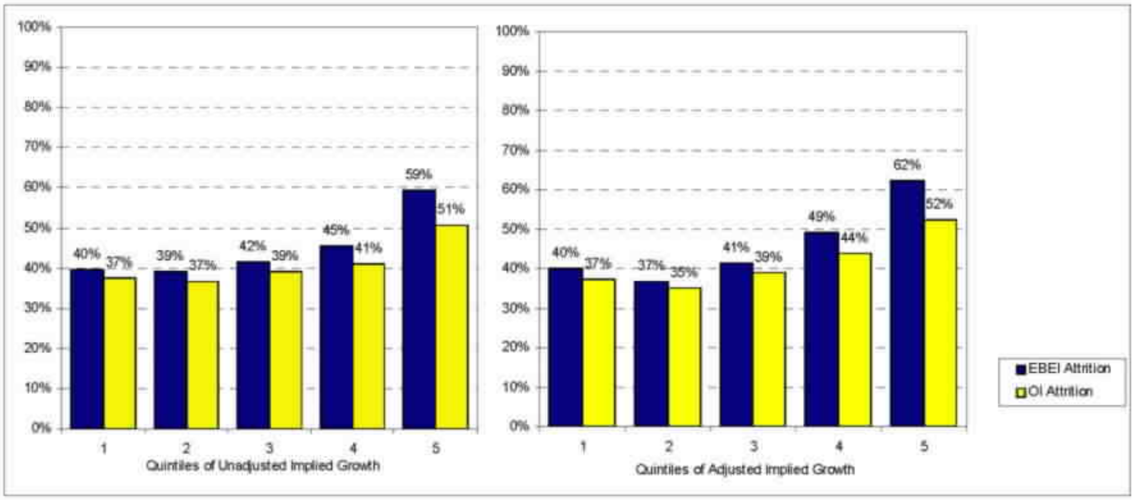
Figure 2. Realized Growth Rates by Quintiles of Implied Growth



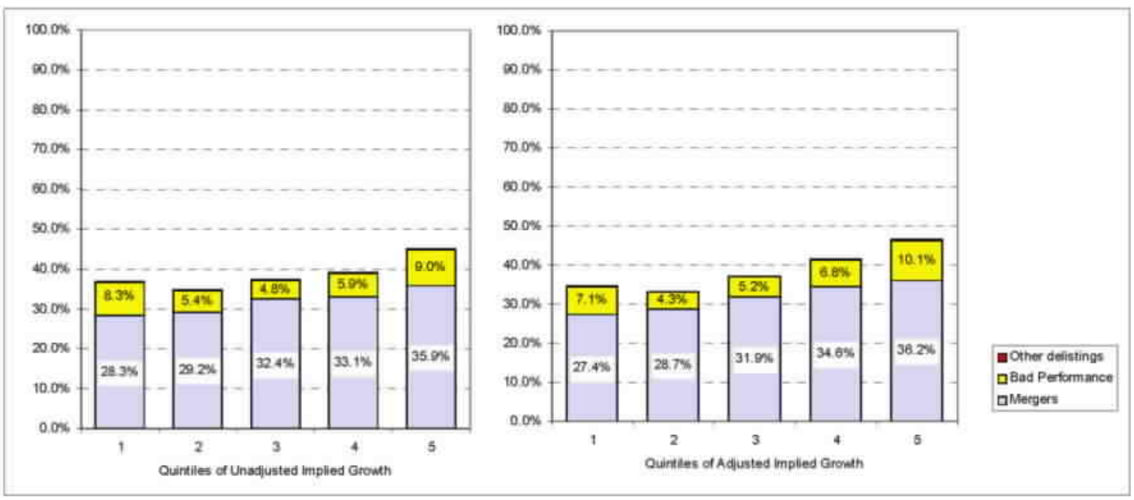
The figure plots average growth in four-year cum-dividend earnings before extraordinary items (*EBEI*) or operating income before depreciation (*OI*) by quintiles of unadjusted (adjusted) implied growth. Unadjusted (adjusted) implied growth is based on raw analyst earnings forecasts (forecasts adjusted for predictable forecast errors (Gode and Mohanram 2009)). Growth rates are calculated as $GR_{t+4,t+8} = X_{t+8}^{cumd} / X_{t+4}^{cumd} - 1$, where $X_T^{cumd} = \Sigma_{[t=T-3,T]}(E_t) + \Sigma_{[t=T-3,T-1]}((1+r)^{4-t}-1)d_t$, and E_t is realized earnings for year t, d_t is dividends declared in year t, and r is the risk-free rate at period t.

Figure 3. Sample Attrition

Panel A. Sample Attrition Rates during [*t*, *t*+8] by Quintiles of Implied Growth



Panel B. Reasons for Delisting during [*t*, *t*+8] by Quintiles of Implied Growth



The figure documents the rates and causes of sample attrition within eight years following implied earnings growth estimation. Unadjusted (adjusted) COE are based on raw analyst earnings forecasts (forecasts adjusted for predictable errors). Percentages are calculated using firms with available implied earnings growth estimates at time *t*.

Panel A reports average percentage of firms with unavailable four-year cum-dividend earnings growth by quintiles of implied growth. *EBEI* (*OI*) refers to growth in earnings before extraordinary items (operating income before depreciation).

Panel B reports average percentage of firms delisted from the exchanges. "Bad performance" category includes delistings due to various adverse events, including bankruptcies, liquidations, and failure to satisfy listing requirements. "Mergers" category includes delistings following merger and acquisition activity, or stock exchanges. "Other delistings" include all delistings not included in the two previous categories (for example, moving to a different exchange). Delisting classification is performed based on CRSP delisting codes; bad performance-related delistings are coded following Shumway (1997).

Table 1. Descriptive Statistics

Variable	Mean	10%	25%	Median	75%	90%
Firm Characteristics						
Size	3163	64	161	517	1840	6456
B/M	0.615	0.185	0.317	0.517	0.779	1.144
Beta	1.067	0.292	0.580	0.969	1.410	1.997
Ret_{-12}	0.179	-0.324	-0.107	0.117	0.376	0.722
Ltg	0.171	0.065	0.100	0.140	0.200	0.325
dIndROE	-0.029	-0.134	-0.064	-0.013	0.026	0.065
RDSales	0.030	0.000	0.000	0.000	0.016	0.097

The table reports descriptive statistics for a sample of 50,636 firm-year observations from 1980 to 2007. *Size* is the market capitalization, *B/M* is the book-to-market ratio, *Beta* is the CAPM beta, *Leverage* is the ratio of the book value of debt to the market value of equity, Ret_{-12} is the past one-year buy-and-hold return, *Ltg* is the long-term growth consensus forecast from *I/B/E/S*; *dIndROE* is the industry ROE minus the firm's average forecasted ROE over years *t*+1 to *t*+4; *RDSales* is the ratio of R&D expenses to sales.

Table 2. Cost of Equity Estimates

Panel A. Simultaneous COE and Growth Estimation

Variables	Unadjusted Forecasts			Adjusted Forecasts		
	Regression Coefficients (λ)	**Driver's Standard Deviation (Std)**	**λ*Std**	**Regression Coefficients (λ)**	**Driver's Standard Deviation (Std)**	**λ*Std**
Intercept	0.035 [1.01]			0.014 [0.61]		
MB	0.399 [13.73]***			0.321 [10.52]***		
MB * ***LogSize***	-0.023 [2.89]***	0.72	-0.017	-0.004 [0.61]	0.72	-0.003
MB * ***MB***	-0.056 [7.01]***	2.32	-0.129	-0.042 [7.58]***	2.32	-0.098
MB * $\boldsymbol{LogRet_{-12}}$	-0.015 [2.20]**	0.42	-0.006	0.083 [5.06]***	0.42	0.034
MB * ***Beta***	0.005 [0.55]	0.62	0.003	-0.014 [2.48]**	0.62	-0.009
(1-MB) * ***dIndROE***	1.149 [4.48]***	0.09	0.100	0.972 [5.09]***	0.09	0.085
(1-MB) * ***Ltg***	0.008 [0.19]	0.11	0.001	0.302 [7.13]***	0.11	0.033
(1-MB) * ***RDSales***	0.355 [2.56]**	0.07	0.023	0.203 [1.88]*	0.07	0.013
R^2	48.9%			54.3%		

***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Panel B: Descriptive Statistics COE and Growth Estimates

Variable	Mean	10%	25%	Median	75%	90%
Unadjusted COE and Growth						
r_{SE}	0.082	0.040	0.057	0.077	0.102	0.134
r_{CT}	0.111	0.067	0.083	0.100	0.124	0.157
r_{GLS}	0.103	0.068	0.082	0.099	0.120	0.143
r_{PEG}	0.111	0.072	0.087	0.105	0.129	0.158
g_{SE}	0.006	-0.030	-0.022	0.004	0.026	0.046
Adjusted COE and Growth						
r_{SE}	0.069	0.032	0.047	0.063	0.085	0.117
r_{CT}	0.095	0.053	0.068	0.084	0.102	0.127
r_{GLS}	0.094	0.060	0.075	0.091	0.111	0.133
r_{PEG}	0.102	0.066	0.081	0.097	0.118	0.144
g_{SE}	0.004	-0.030	-0.017	0.002	0.021	0.038

Table 2 (continued)

Panel C: Correlations Among COE Measures

	Unadjusted COE Measures					Adjusted COE Measures			
	r_{SE}	r_{CT}	r_{GLS}	r_{PEG}		r_{SE}	r_{CT}	r_{GLS}	r_{PEG}
r_{SE}	—	0.489 (26/0)	0.709 (28/0)	0.529 (28/0)	r_{SE}	—	0.314 (18/3)	0.605 (27/0)	0.429 (28/0)
r_{CT}		—	0.522 (28/0)	0.634 (28/0)	r_{CT}		—	0.384 (28/0)	0.309 (27/0)
r_{GLS}			—	0.559 (28/0)	r_{GLS}			—	0.406 (28/0)
r_{PEG}				—	r_{PEG}				—

The table reports results of COE estimation using simultaneous COE and growth estimation approach. The sample consists of 50,636 firm-year observations from 1980 to 2007.

Panel A reports average of yearly coefficients from cross-sectional regression (6) estimated using WLS:

$$X^i_{cT}/B^i_0 = \gamma_0 + \gamma_1 MB^i + (\lambda_{Beta}Beta^i + \lambda_{Size}LogSize^i + \lambda_{MB}MB^i + \lambda_{ret}ret^i_{-12})MB^i x^i_R$$
$$+ (\lambda_{Ltg}Ltg^i + \lambda_{dROE}dIndROE^i + \lambda_{RdSales}RdSales^i)(1-MB^i)x^i_G + v^i,$$

where X_{cT}/B_0 is four-year cum-dividend earnings forecast, divided by per-share book value of equity; MB is market-to-book ratio, calculated as stock price from *I/B/E/S* as of June of year $t+1$, divided per-share book value of equity; *Beta* is CAPM beta estimated over sixty months preceding June of year $t+1$; *LogSize* is the log of the market value of equity as of June of year $t+1$; ret_{-12} is the twelve-month buy-and-hold stock return preceding June of year $t+1$; *Ltg* is the long-term growth consensus forecast from *I/B/E/S* as of June of year $t+1$; *dIndROE* is the industry ROE minus the firm's average forecasted ROE over years $t+1$ to $t+4$; *RDSales* the ratio of R&D expenses to sales. Regressions are estimated by year, with an iterative procedure described in detail in Section 2.

The first (last) three columns of Panel A use raw analyst earnings forecasts (forecasts adjusted for predictable errors). The panel reports time-series averages of estimated regression coefficients (λ), time-series averages of yearly standard deviations of risk and growth drivers (Std), and the product of the above averages (λ*Std). Absolute values of Fama-MacBeth t-statistics with the Newey-West adjustment for autocorrelation are reported in brackets.

Panel B reports descriptive statistics for COE and growth estimated using regressions from Panel A, as well as descriptive statistics for benchmark COE models. r_{SE} is the COE measure based on our model, g_{SE} is our implied terminal growth in residual earnings, , r_{CT} is the COE measure based on Claus and Thomas (2001) model, r_{GLS} is the COE measure based on the GLS (Gebhardt et al. 2001) model, r_{PEG} is the COE measure based on the PEG model (Gode and Mohanram 2003). Unadjusted (adjusted) COE are based on raw analyst earnings forecasts (forecasts adjusted for predictable errors).

Panel C reports average by-year correlations between COE measures. Numbers in parentheses indicate the number of years with significantly positive/negative correlations.