EXCESS IMPLIED RETURN (EIR)

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1. Overview

Investors often start their analysis using screens that provide preliminary indicators of mispriced stocks. The forward PE ratio and the PEG ratio (PE ratio divided by short-term growth) are examples of widely used screens. These screens incorporate the common sense idea that "earnings ought to be bought as cheaply as possible" and "cheaply bought earnings lead to higher expected returns." The PEG ratio is an enhancement of the PE ratio because it adjusts for short-term growth, but the PEG ratio does not adjust for differences in long-run growth, dividend payouts, and risk.

This spreadsheet presents a new screen called Excess Implied Return (EIR), which corrects for factors omitted by the PEG. EIR is the difference between the implied expected return for a stock and its required return. The expected return is inferred from the current stock price and forecasted earnings and dividends while the required return is derived using CAPM. Thus, we compute EIR in two independent steps as follows:

- First, we compute the discount rate implied by the current stock price and earnings forecasts. The implied discount rate is the same as an internal rate of return on an investment and measures the expected return. We refer to this discount rate as the "implied return" (IR). If the implied return is high, the stock may be risky or underpriced. On the other hand, if the implied return is low, the stock may be low risk or overpriced.

- Second, to separate the effect of risk versus mispricing on the implied return, we compare the implied return to the return required based on risk. We derive the required return using CAPM. We then normalize the implied return by subtracting the required return. We call this "excess return" Excess Implied Return (EIR). If EIR exceeds zero, then the stock may be underpriced, and vice versa.

Like all screens, EIR is susceptible to measurement errors in inputs; EIR should be viewed as a starting point for analysis, not the final word.

1.1. Motivating our approach: The PEG ratio and its pros and cons

We now discuss the PEG ratio and explain how EIR overcomes some of its limitations.

$$\text{PEG ratio} = \frac{\text{Forward PE ratio}}{\text{Growth}} = \frac{P_0/e_1}{(e_2-e_1)/e_1}$$

The PEG ratio captures the idea that if a low P/E firm has high growth, then it may be an attractive investment, and vice versa. The PEG ratio is simple to compute using readily available data and does not require subjective adjustments. However, the PEG ratio has the following limitations:

- Although it tries to correct for growth by dividing P/E by growth, such correction is ad-hoc and without a conceptual foundation. For example, one alternative way to correct for growth is to add growth to the inverse of forward PE ratio.

- It ignores earnings growth beyond Y2.

- It ignores dividend payout even though investors prefer to own a company that has a high dividend payout and yet can sustain high growth.

- It ignores information about a company's risk. Many high growth companies are also high-risk companies. Investors like the growth but not the risk.

EIR deals with the first three points via the computation of implied return (IR). EIR deals with the last point by subtracting required return computed using CAPM from IR. Compared to PEG, EIR requires more inputs, computations, and concepts. We next spell out the inputs and the computations of EIR.

2. Our screen: Excess Implied Return (EIR)

EIR is motivated by the idea that an investment is "attractive" if its implied excess return exceeds the return that one should require based on its risk. We measure the latter using CAPM. EIR is computed in three steps described below.

2.1. Step 1: Infer implied return (IR)

Our measure of the implied return is the discount rate (r_e) inferred from the current stock price and earnings forecasts. Such reverse engineering requires the following inputs:

Firm-specific inputs:

- P_0: Current stock price per share

- e_1 and e_2: Analyst forecasts of earnings per share for Y1 and Y2.

- d_1: Analyst forecast of dividends per share for Y1. If this is not available, then d_1 is approximated by current dividend payout times e_1.

- g: Terminal growth rate in residual change in earnings.

Common input for all firms:

- r_L: forward earnings yield or forward E/P ratio in the very long run. Historical data suggests r_L to be about 6%.

We set $g = r_e - r_L$ to capture the idea that growth and risk go together. Since r_L is the same for all firms, a high g implies a high r_e, and vice versa. We then use the following Ohlson-Juettner (OJ) valuation formula (developed later) to solve for the discount rate that relates current stock price to future earnings forecasts.

$$\text{Implied return (IR) or } r_e = \frac{(e_2 - e_1)/e_1 + r_L}{(r_L P_0/e_1 + 1 - d_1/e_1)}$$

2.2. Step 2: Compute required return using CAPM (RR)

We infer the required return based on risk using CAPM. Most CAPM implementations use historical realized return or surveys to set the market risk premium. Our spreadsheet allows this approach. However, we believe that the computation of implied risk premium for the market portfolio should be the same as that for individual stocks. Therefore, we use the IR formula to estimate the implied risk premium for the market portfolio.

This step requires the following inputs:

- r_f: risk free rate used to derive market risk premium [yield on 10-year government bonds]

- β: company's beta

- mP_0: Price of the market portfolio (S&P index) per share

- me_1 and me_2: Analyst forecasts of earnings per share for the market portfolio (S&P index) for Y1 and Y2

- md_1: Analyst forecast of dividends per share for the market portfolio (S&P index) for Y1

- r_L: forward earnings yield or forward E/P ratio in the very long run described above

This step implies that the required return on the market portfolio is equal the implied return on the market portfolio, i.e., the overall market is assumed to be correctly priced. That is, our procedure can only detect relative mispricing of individual firms.

2.2.1.   A simplified version of the above approach

The above derivation of the market risk premium requires mP_0, me_1, and me_2. Sometimes, it is easier to get the forward PE ratio for the market and expected growth in market earnings. In that case, one can derive market risk premium using the following:

- Assumed $mP_0 = 10$. There is no loss of generality.

- Derived $me_1 = 10/\text{Forward PE}$. This PE for the market is available on several popular websites such as Yahoo finance.

- $me_2 = (1+\text{growth rate of } me_1)*me_1$. This forward growth in market EPS is also quoted in the media.

- The dividend payout: any reasonable number is acceptable.

If one wants to derive a pre-set market risk premium, then one can try different growth rates for me_1.

2.3.   Step 3: EIR = implied return – required return based on CAPM

Our screen is the difference of the implied return inferred using the OJ model and the required return derived using CAPM. There is a 50/50 chance that any given firm has positive/negative EIR. The spreadsheet highlights the extent of deviation from zero.

3.   EIR: Spreadsheet implementation

The spreadsheet comprises five columns: one refers to market input and the subsequent four refer to individual firms. A graph plots a firm's implied return (IR) on y-axis and its CAPM required return on x-axis. To make it easy to see how much IR differs from the CAPM required return, the graph includes a 45% line. EIR is positive above the line, and vice versa. Significant deviations from the line are the most likely candidates for mispricing.

The spreadsheet also provides additional screens using alternative measures of short-term growth in earnings and growth beyond the horizon. For comparison, it also computes the PEG ratio.

3.1.   Deriving IR under three alternate assumptions about long-term growth g

This section develops the conceptual foundations of the previously stated IR. We also illustrate two additional IR metrics that are simpler and thus help to assess the robustness of EIR. Before moving on, we note that the conceptual issues are on the sophisticated side. This will not cause any real problems though: An understanding of the derivations is not essential to applying the spreadsheet.

The OJ model, as noted in VAL2, can be expressed as follows:

$$P_0 = \underbrace{\frac{e_1}{r_e}}_{\text{Anchor}} + \underbrace{\frac{e_2 - e_1 - r_e\,(e_1 - d_1)}{r_e\,(1+r_e)}}_{\text{Until horizon}} + \underbrace{\frac{e_3 - e_2 - r_e\,(e_2 - d_2)}{r_e\,(1+r_e)^2}}_{\text{Beyond horizon}} + \ldots$$

The model equates equity value to capitalized forthcoming earnings (e_1/r_e) plus the present value of capitalized residual changes in earnings. The residual change in earnings in year 2 equals ($e_2 - e_1 - r_e\,(e_1 - d_1)$), which is the change in earnings ($e_2 - e_1$) minus the change in earnings expected if the reinvestment ($e_1 - d_1$) yielded returns at r_e. The residual change in earnings is capitalized by dividing it by r_e.

If one assumes that the horizon growth rate g starts a year earlier, that is, from year 3 onwards, then the formula above simplifies to the following: [You can view the "Simulation" tab of the VAL4 spreadsheet for a simulation of this earnings pattern.]

$$P_0 = \frac{e_1}{r_e} + \frac{e_2 - e_1 - r_e\,(e_1 - d_1)}{r_e\,(r_e - g)}$$

One can now infer r_e as follows:

$$r_e = A + \mathrm{SQRT}\left(A^2 + \frac{e_1}{P_0} * \left(\frac{e_2 - e_1}{e_1} - g\right) \right)$$

where

$$A = \frac{1}{2}\left(g + \frac{d_1}{P_0}\right)$$

To infer r_e using the above formula requires some value of g, the growth rate of the residual change in earnings. The spreadsheet allows for three possibilities. Out of these three, the third one – which captures the idea that growth comes with risk – is the most reasonable. This case, described in Assumption III below, provides our main measure of implied returns.

3.1.1. Assumption I: g = short-term growth in earnings, $(e_2-e_1)/e_1$

Given the restriction $g = (e_2-e_1)/e_1$, reverse engineering the OJ formula implies:

$$r_e = g + \frac{d_1}{P_0}$$

This familiar expression shows that the growth rate plus dividend yield determines the discount factor. It serves as benchmark when, effectively, short and long term growth are the same.

3.1.2. Assumption II: g = long-run GDP growth

One can assume that, in the long run, all firms will grow at the long-run GDP growth rate of about 3%.

If g is set equal to zero and there are no dividends, then PEG and r_e have a one-to-one relation. More generally, one can expect PEG and r_e to rank firms similarly.

3.1.3. Assumption III: $g = r_e - r_L$ to capture the idea that growth comes with risk

This case gives the formula discussed initially. Recall that r_L is the forward earnings yield in the long run. Setting $g = r_e - r_L$ in the OJ derivation, one obtains:

$$P_0 = \frac{e_1}{r_e} + \frac{e_2 - e_1 - r_e\,(e_1 - d_1)}{r_e\,r_L}$$

This leads to the previously stated implied return formula:

$$r_e = \frac{(e_2 - e_1)/e_1 + r_L}{(r_L P_0/e_1 + 1 - d_1/e_1)}$$

As a benchmark, if $P_0/e_1 = 1/r_L$ and the payout is zero, then r_e is the simple average of EPS growth and r_L.

3.2. Why EIR can deviate from zero

Besides mispricing, EIR can deviate from zero for the following reasons:

- Analyst forecasts available on public web sites may be stale and subject to potential biases. Thus, the forecast can differ markedly from the market's true but unobservable expectations. Consider a firm that announces bad news that lowers the analyst forecasts and the stock price. Suppose it takes a few days for the analyst forecasts to be updated on public web sites. In those few days, the price will appear abnormally low relative to publicly available analyst forecasts and the EIR will appear to be high. If

stale forecasts are the cause of high EIR, then a high EIR suggests downward revisions in forecasts, and vice versa. Thus, "if it looks too good to be true, it probably is not".

- An extensive literature addresses the validity of CAPM. Much of it is not supportive.

- The assumptions that derive IR may be questionable.

  - Optional point: For example, the estimated pattern of growth may not be correct. In the OJ formula, the perpetual growth also defines the rate at which the short-term growth decays to perpetual growth. That is, the model does not require estimates of persistence of growth. This is an advantage and a disadvantage. The advantage is that the model does not require subjective estimates of persistence. Inputting such subjective estimates will defeat the purpose of using these metrics as screens. However, the model also eliminates a degree of freedom. The market may indeed view that firms differ in the persistence of their growth.

3.3. A variation of our metric: Adjusting for analyst over-optimism

Analysts' expectations of earnings growth may be too optimistic because of unrealistic expectations of margin expansion. To strip out the effect of unrealistic margin expansion, we allow earnings growth to be replaced by sales growth using the drop down box. [VAL3 spreadsheet addresses the issue of adjusting for analyst biases.]

4. Why the implied return and required return correlate

A zero or negative correlation between the implied return (IR) and the required return (RR) would cause a large variance in their difference (EIR). It would suggest that IR measures expected returns poorly, or CAPM measures risk poorly, or both. However, IR and RR are positively correlated due to two reasons.

First, growth and r_e correlate positively. To appreciate this point, note the following:

- Growth is in the numerator of the IR formula, which implies a perfect correlation if one holds the denominator constant.

- The denominator of IR has a positive correlation with the numerator. This could lead to a negative correlation between growth and IR. However, empirically, the denominator effect is too weak to override the numerator effect. (In other words, while the PE and the negative of the payout do indeed correlate positively with growth, these relations are usually modest.)

Second, even a cursory review of empirical data will show that high beta stocks are generally high growth stocks (sales as well as earnings). Low beta stocks (less than 0.7, say) almost never have high growth.

To summarize, growth acts as a latent variable that makes IR correlate positively with RR. The extent of the correlation depends on the cross-sectional variance in the betas; the greater the variation, the greater the correlation.

5. Using EIR

EIR is not a sure signal of mispricing, but a screen to select firms for further examination. It is based on limited but key public information about each firm – its IR component incorporates price, earnings, short-term and long-term earnings growth, and the dividend payout, while the RR component incorporates risk. We believe that these value attributes are compelling and comprehensive, and the EIR formula is intuitive. However, EIR's real test is its success in pointing towards mispriced firms. No screening tools can be useful forever because efficient markets tend to blunt all such tools over time.