The search for under-valued stocks

What is the Justifiable or Sustainable P/E Ratio?

It is possible to calculate a "Justifiable" long-run P/E level that can be used to identify under-valued stocks.

This Justifiable P/E can be used to judge whether the stock market as a whole is trading at a Justifiable level. It can also be used to calculate an assumed selling price for any stock after a five or ten year holding period. This is important in performing implicit value calculations.

In performing implicit value calculations an investor may assume that after a five or ten year holding period all stocks will revert to some sustainable long-term P/E ratio such 12 to 15. This article examines how to estimate the justifiable P/E.

This Justifiable (or sustainable) P/E level will vary with the investors required minimum rate of return and with the growth and dividend policy of the stock. The Justifiable P/E can only be expected to work on average and will never work in every case.

For groups of stocks such as the Dow 30 stocks or the TSX index, it is possible to make educated and conservative predictions about the average future earnings growth. In contrast it is harder to do that for an individual stock. An individual stock is subject to many random events and risks that are, to a large degree, averaged away when we deal with a larger group of stocks.

Even with groups of stocks the level of the Justifiable P/E is quite volatile depending on the assumptions regarding growth, dividend policy, and required minimum return.

I calculated the following Justifiable P/E levels by "discounting" the expected cash flows that would result from holding a stock permanently.

Required minimum rate of return	Company's Return on Equity	Dividend pay-out ratio	Sustainable Growth rate of earnings and dividend (ROE * 1-payout)	Calculated Justifiable P/E
7%	7%	30%	4.9%	**14.29**
7%	8%	30%	5.6%	**21.43**
8%	8%	30%	5.6%	**12.50**
7%	8%	50%	4.0%	**16.67**
8%	8%	50%	4.0%	**12.50**
7%	8%	100%	0.0%	**14.29**
8%	8%	100%	0.0%	**12.50**
7%	10%	50%	5.0%	**25.00**
8%	10%	50%	5.0%	**16.67**

Investor Minimum Required Rate of Return:

With long term government bond yields currently in the range of 4 to 5%, equity investors require a minimum expected return of about 7% to 8% to compensate for the additional risk of equities. While we would all like to earn more than that, supply and demand forces should cause the market to adjust prices to a point where we can expect only 7% to 8%.

The **only** way that a company can provide investors with an 8% minimum return **over its life** is for the company to make an average Return On Equity ("R.O.E.") of a minimum 8%. This applies to the returns to investors as a group, it does not prevent individual investors from making a high return by outsmarting other investors in trading which is a zero sum game.

Limitations of Sustainable Growth:

Individual companies can grow at high rates, but only temporarily. No company can perpetually grow faster than the economy - otherwise it would eventually grow bigger than the entire economy (an impossibility). Economist predictions for the long run growth of the economy are in the range of 4 to 5%.

There is also a relationship between investor required return and an average company's R.O.E.. If investors require 8% then company's should also find that the projects in which they invest are priced such that an 8% return results. In the long run other companies enter the industry and compete for resources such that the return on equity to all companies is driven toward the minimum required by investors, in this case 8%.

So, in equilibrium, investors require 8%, therefore company's returns gravitate to 8%. The company's growth rate can then be calculated using the sustainable relationship that growth = R.O.E. times (1 - the dividend pay-out ratio).

If mature companies tend to dividend out about 40% of earnings, then with an 8% R.O.E., they should grow earnings at 8%*(1-.4)= 4.8%. Comfortingly, this is consistent with the economists predictions of economic growth.

Some companies will consistently earn more than the average ROE, but this will likely be offset by others that earn below average.

Conclusions:

Assuming that investors require an 8% return, then it is prudent to assume that sustainable company R.O.E.s will also be about 8%. A 40% dividend pay-out ratio is then consistent with an economic growth of 8%*(1-.4) = 4.8%. This 8% R.O.E., yields a sustainable justifiable P/E of 12.5. Interestingly, the sustainable P/E remains at exactly 12.5 across a broad range of dividend pay-out ratios from 100% all the way down to 10%. At a 100% dividend pay-out ratio this can also be calculated as the value of a perpetuity, using a return of 8%, $1.00/.08 = $12.5 again a P/E of 12.5.

Similarly if investors require a 7% return and the sustainable ROE becomes 7%, then the sustainable P/E is 14.29. (Not coincidently 1/.07 = 14.29).

A stock market average P/E above 15 would then seem to require that either investors are satisfied with equity returns below 7% or it requires an unsustainable assumption where companies deliver a long-term ROE that is higher than the investors require.

Recommendations:

My conclusion is that the equilibrium Justifiable P/E on a stock market index is currently between 12.5 and 15. Given recent very low interest rates I would focus on a required 7% ROE and a justifiable P/E of about 15. This is where it "should" be trading based on "normalized" earnings. Note that if current earnings are thought to be artificially and temporarily lowered by recession and unusual write-offs, then a higher P/E can be justified.

In performing intrinsic value calculations, investors should assume that the selling P/E, for a healthy company, **after** a five to ten year holding period should be 12.5 to 15. A higher assumed P/E can only be assumed if the company is thought to have unusually strong and enduring competitive advantages and barriers to entry that protect it from competition. A lower P/E should be assumed if the company is unhealthy or is exposed to unusually heavy competition.

Observations:

As investors we are quick to demand a minimum 8% return from every company. Given that many companies pay no dividend, this is mathematically equivalent to requiring that the company grow its earnings by 8% annually. An 8% annual growth, rather than being something to brag about, is then a minimum acceptable level for a non-dividend paying company, if investors require an 8% return. Before you conclude that such a company can meet your 8% return, you must consider if it can grow earnings per share at 8% minus any dividend yield.

It has often been noted that a low interest rate environment can justify a higher sustainable P/E. This is true. In a high interest rate environment of say 9%, if investors require a 12% return from stocks, then the equilibrium sustainable P/E is 1/0.12 = 8.33 which is indeed lower than the sustainable 12.5 P/E that applies if investors require "only" 8%.

Justifying a **stock market average** P/E of 20 requires that either investors require only a 1/20 =5% rate of return or that we were entering into a temporary period where the market is expected to earn much higher than the investors required minimum. At the end of both 1998 and 1999, the DOW P/E was at 24. It seems unlikely that investors were signaling that they only required a 1/24 = 4.2% rate of return. Instead investors may have thought that earnings going forward were temporarily going to grow at a rate much higher than their 8% required rate of return.

My math indicates that this would have required the DOW earnings to grow at about 13% annually for 10 years before settling back to a more sustainable 4.8% annual growth (calculated as an 8% R.O.E. times a 40% dividend pay-out). A third possibility is that investors thought that companies could perpetually achieve, through technology, an ROE that was above the investors required rate of return. But, this seems to violate equilibrium conditions.

This was unrealistic. The market was simply greatly over-valued and investors paid the price for that with the market crash of the early 2000's.

Exceptions to the Rule:

Individual companies can grow at very high rates temporarily, therefore the above analysis does not suggest that very high P/E levels can **never** be justified. The above analysis deals with sustainable P/Es in the long run for individual companies and with diversified groups of stocks in both the short and long run.

For individual stocks (as opposed to the market average), I have provided a separate table of justifiable P/E ratios.

If investors as a whole become very pessimistic then they could, for example, demand a 10% return even though the companies are only earning 7% in the long run. This could be achieved (going forward) if investors bid the average P/E down to 7.7. Today, this seems impossibly low but that is exactly where the DOW P/E was on December 31, 1980.

Possibly technological advances and new research and patents can allow companies to earn returns that are somewhat higher than the rate of return required by investors. **If companies can perpetually achieve 8% R.O.E.s while investors only require 7%, then a P/E of 21.4 can actually be justified if the companies pay-out only 30% of earnings. This scenario seems to violate equilibrium conditions and is not something I would count on.**

One always has to be cautious in applying theoretical rules to the stock market index or (much more so) to individual stocks. The market can remain at theoretically unsustainable low or high levels for many years as long as investors keep it there. Eventually it "should" correct, but it could take many years.

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How to Pick Stocks by Using the P/E and PEG Ratios

In investing as in most areas of life, a little knowledge can be a dangerous thing.

Most investors have a rough understanding that low Price to Earnings ("P/E") stocks are or might be bargains and that high P/E stocks are expensive. Most investors also understand that high growth stocks usually have a higher P/E.

Unfortunately, most investors have very little understanding of exactly why this is and exactly how the math works. Therefore, most investors are not in a position to judge when the P/E of a stock is too high and when it truly is a bargain.

Below are concise and practical rules for use of the P/E ratio.

For the more ambitious reader more detailed analysis of the mathematics of the P/E ratio is available. See the following:

www.investorsfriend.com's Practical Guide to P/E and PEG ratios

(Keep this Guide handy when placing Buy and Sell orders on the basis of P/E)

The P/E ratio values a stock as a multiple of its initial earnings. Fundamentally this is actually not an ideal way to value a stock because the future earnings of a stock could vary radically and in unexpected ways from its initial earnings. Nevertheless, the P/E ratio can provide some guidance in certain cases.

The P/E ratio can **only** be used to value stocks for which a **representative** initial earnings per share is available.

- The earnings **must** be adjusted for unusual gains and loses. Never apply the P/E ratio to judge if a stock is a bargain without checking if the earnings are abnormally high or low due to some unusual or one-time items. The use of a P/E ratio to judge a stock implicitly assumes that the earnings provide a sustainable basis from which to forecast future earnings.

- P/E is of little or no use for very cyclic or commodity linked stocks since we can not judge if the initial earnings are in any way indicative of future earnings

- P/E is of little or no use for start-up companies since the earnings will not have reached a stable representative level

- P/E ratio is of most use in cases where a company has a history of stable earnings or stable growth which is expected to continue in the future.

For stable, predictable companies, the maximum justifiable P/E ratio is heavily dependent on the growth rate, the dividend pay-out ratio, and the appropriate required rate of return (which in turn is affected by the risk free long term interest rate, expected inflation and the non-diversifiable risk of the company).

The following table indicates the highest justifiable P/E ratio for various levels of these variables. A stock trading at a P/E level substantially below the maximum level that can be justified by its perceived growth, dividend and risk may be a bargain. However, investors should also show due respect to the "wisdom" of the market, there may be unknown reasons why a stock is trading at what appears to be a bargain level.

First ten years annual growth expected	Subsequent stable growth	First 10 years Dividend pay-out ratio	Subsequent stable dividend pay-out ratio	Required Return	Maximum Justifiable P/E ratio	PEG Ratio
4%	4%	0%	50%	8%	8.8	2.19
6%	4%	0%	50%	8%	10.6	1.76
8%	4%	0%	50%	8%	12.7	1.59
10%	4%	0%	50%	8%	15.3	1.53
15%	4%	0%	50%	8%	23.7	1.58
20%	4%	0%	50%	8%	36.2	1.81
25%	4%	0%	50%	8%	54.4	2.18

First ten years annual growth expected	Subsequent stable growth	First 10 years Dividend pay-out ratio	Subsequent stable dividend pay-out ratio	Required Return	Maximum Justifiable P/E ratio	PEG Ratio
4%	4%	0%	50%	10%	5.2	1.29
6%	4%	0%	50%	10%	6.2	1.04
8%	4%	0%	50%	10%	7.5	0.94
10%	4%	0%	50%	10%	9.0	0.90
15%	4%	0%	50%	10%	14.0	0.93
20%	4%	0%	50%	10%	21.4	1.07
25%	4%	0%	50%	10%	32.1	1.28
First ten years annual growth expected	Subsequent stable growth	First 10 years Dividend pay-out ratio	Subsequent stable dividend pay-out ratio	Required Return	Maximum Justifiable P/E ratio	PEG Ratio
4%	4%	50%	50%	8%	12.7	3.18
6%	4%	50%	50%	8%	15.0	2.49
8%	4%	50%	50%	8%	17.6	2.20
10%	4%	50%	50%	8%	20.6	2.06
15%	4%	50%	50%	8%	30.7	2.04
20%	4%	50%	50%	8%	45.2	2.26
25%	4%	50%	50%	8%	66.1	2.64
First ten years annual growth expected	Subsequent stable growth	First 10 years Dividend pay-out ratio	Subsequent stable dividend pay-out ratio	Required Return	Maximum Justifiable P/E ratio	PEG Ratio
4%	4%	50%	50%	10%	8.8	2.20
6%	4%	50%	50%	10%	10.3	1.71
8%	4%	50%	50%	10%	12.0	1.49
10%	4%	50%	50%	10%	13.9	1.39
15%	4%	50%	50%	10%	20.3	1.35

20%	4%	50%	50%	10%	29.6	1.49
25%	4%	50%	50%	10%	42.7	1.71

From this table, it is apparent that it is dangerous to generalize about the P/E ratio. For example statements such as a P/E of over 20 is "too high" or a P/E of under 10 is always a bargain are quite false and quite dangerous. A fair level of P/E for a stock can only be judged after considering the likely growth, the dividend pay-out ratio and the required rate of return. These variables MUST be input into a calculation formula or looked up in a table such as this. It is interesting that many analysts rely on the use of P/E ratios and yet tables such as this are not widely available.

It does appear that some very rough generalizations can be made about the PEG, but only if we make allowances for the dividend pay-out ratio and the required rate of return. The PEG ratio is the P/E divided by the initial growth rate. Assuming an 8% required rate of return, a rule of thumb for P/E is that for companies which retain all earnings (it is assumed that a dividend of 50% will apply beginning after 10 years), the PEG ratio should not exceed 1.5. For companies that dividend out 50% of earnings, the PEG ratio should not exceed 2.0 If the required return is changed to 10%, it appears maximum PEG should be no higher than about 0.9 if there is no initial dividend and no higher than about 1.4 for an initial dividend pay-out ratio of 50%.

Growth - Higher initial growth rates can lead to dramatically higher justifiable levels for the P/E ratio. The initial growth rate is the forecast average annual growth rate for the first ten years. After ten years it is assumed that the growth rate will stabilize at a sustainable level that reflects to normal growth of a healthy company. For a company that pays out 50% of earnings as dividend, a sustainable growth rate is 4% which corresponds to a return on equity of 8%. Note that this refers to growth on a per share basis. A company which grows by 10% but which has issued 10% more shares has a zero growth per share. Note that it is very aggressive to forecast an annual compound growth rate of 15% or higher. It can be very dangerous to pay for this type of growth since there is a large down-side risk if the growth does not appear (i.e. Nortel)

Dividend - Scenarios are provided above for two dividend assumptions. A zero dividend policy is typical of early stage and higher growth companies. A 50% dividend pay-out ratio is more typical of a mature company. In both cases it is assumed that after ten years the dividend pay-out ratio is fixed at 50%. A zero dividend policy assumption for the very long term leads to mathematical difficulties. If all earnings are retained for many decades then the value of the company converges toward zero if the percentage earnings growth is lower than the required return and converges toward infinity if the percentage earnings growth is higher than the required return (a perpetual money machine!). The math suggests that it is more logical to assume that a dividend will occur at some point and I have assumed a pay-out of 50% of earnings starting after ten years.

Return - Two scenarios for the required return are provided, 8%and 10%. This may seem low to those that would "like" 15% but the fact is that in today's low interest rate environment an average stock market return of 8% to 10% is a fair level. In some cases we might like to discount at a higher rate, but alternatively, one can lower the assumed growth rate to deal with risk.

Subsequent growth - The above table is calculated by assuming that the subsequent growth occurs for an additional 40 years. At the end of the total 50 year period it is assumed that all retained earnings are flowed back to the investor. My calculations indicate that the the value of the earnings beyond 50 years would not change the P/E in a material manner.

The above table provides a range to show what the P/E ratio should be over a broad range of growth and for the two dividend and required return assumptions. This should help investors to judge whether a given P/E level is a bargain or not.

August 30, 2001

Disclaimer: The above figures are believed to be mathematically accurate based on the assumptions provided. However, accuracy cannot be absolutely guaranteed.

Modeling Sustainable Earnings and P/E Ratios With Financial Statement Analysis

By St. H. Penman and Xiao-Jun Zhang, June 2002

Abstract

This paper provides a structured financial statement analysis that informs about the sustainability (or persistence) of earnings and the P/E ratio. The P/E ratio measures the amount that investors pay for a dollar of current earnings. Investors buy future earnings, so should pay less for current earnings if the earnings cannot be sustained in the future. If earnings are temporarily high, investors should pay less per dollar of earnings than if earnings were temporarily depressed. While income statements identify some transitory items, the investor is still left with uncertainty as to whether the remaining earnings are sustainable. This paper estimates a model that supplies probabilities of the sustainability of earnings. The model aggregates information in the financial statements into a composite score that serves as a "red flag" about the sustainability of earnings. In out-of-sample prediction tests, the scoring reliably identifies non-sustainable earnings, and also explains cross-sectional differences in P/E ratios. The paper also finds that stock returns are predictable when traded P/E ratios differ from a line fitted to sustainable earnings scores. So, the analysis either points investors to stocks with different risk (and thus different expected returns) or to stocks where earnings are mispriced given the information about their sustainability.

Conclusion

This paper takes the following perspective. The P/E ratio embeds the notion that investors "buy earnings." Investors buy future earnings, but look to current earnings as an indication of future earnings. They are concerned that earnings may not be sustained in the future, and pay less for earnings if they are not sustainable. While investors can adjust earnings for nonrecurring 33 items specifically identified in the financial statements, they still remain uncertain about the sustainability of earnings, and look for a way to quantify that uncertainty. As well as reporting earnings, the financial statements supply additional line item information that provides a commentary on the "quality" of earnings for forecasting, and so aids in the evaluation of the uncertainty. Financial statement analysis elicits that information.

This paper reports a financial statement analysis that supplies probabilities as to the sustainability of earnings, and so reduces investors' uncertainty. The financial statement analysis follows an ordered approach that recognizes that fixed accounting relations structure the financial statements, so should also structure the analysis of those statements. The analysis incorporates features from earlier papers on using financial statements for forecasting, but in such a way that considers the financial statements as a whole, to develop a composite score that summarizes the information that various elements in the financial statements jointly convey about the persistence of earnings.

The analysis is at a coarse level, the aim being to demonstrate an overall architecture that directs further detailed analysis of the financial statements. The empirical analysis is on data pooled over all firms, without consideration of conditions under which a more contextual analysis might be carried out. Even so, the scoring reliably indicates differences between current and future earnings. The scoring also explains cross-sectional difference in P/E ratios, the amount paid by investors for earnings.

Further, the scoring predicts stock returns. This finding may mean that the financial statement scores capture risk in investing, although tests for risk explanations do not suggest so.

Scoring earnings reduces the risk of paying too much for earnings so, as an alternative interpretation, the finding suggests that investors in the past paid too much for earnings (or sold 34 for too little) by ignoring information in the financial statements about the sustainability of earnings.

Justified PE Ratio

Lots of investors and finance professionals use the PE ratio to assess whether a stock is good value or not, however lots of investors and finance professionals do not know how to assess a PE ratio in an absolute sense, and therefore only derive a benefit by comparing PE ratios among different companies. The justified PE ratio can be estimated using an adjusted version of the Gordon Growth Model. This can help investors assess whether or not a stock represents good absolute value as well as good relative value.

The Gordon Growth Model states that the justified share price of a stock can be calculated as:

$$P_0 = \frac{D_0 \times (1 + g)}{k - g}$$

Where:

Po is the justified share price at the present time

Do is the most recent dividend (full year dividend)

g is the sustainable dividend growth rate of the company

k is the cost of equity of the company

So if the company had a 10% cost of equity, a sustainable growth rate of 5%, and a dividend of $2 per share last year, the justified share price is calculated as:

2 x (1.05)/(0.1 - 0.05) = $42 per share.

We can get a justified PE ratio by ensuring that the Do is set to 1, or by dividing both sides of the equation by earnings:

$$\frac{P_0}{E} = \frac{D_0/E \times (1 + g)}{k - g}$$

So, if the company again has a cost of equity of 10%, a sustainable growth rate of 5%, a dividend of $2 per share last year and earnings of $3 per share last year, the justified PE ratio would be:

(2/3) x (1.05)/(0.1 - 0.05) = 14

Now we can cross check this. Previously we calculated using the Gordon Growth Model that the justified share price of the company was $42. We know from the last example that the earnings per share were $3 per share. 42/3 = 14, so both our equations agree with eachother.