THE FALLACY OF PEG RATIOS

It is shocking that in the modern era of computing, where people have the equivalent power of a 1980s-era super computer on their desktop, that so many investors continue to use an old, flawed, rule-of-thumb valuation measure, the PEG ratio.

WHAT IS IT?

In case you have never come across this quaint, and potentially dangerous little valuation shortcut, let me provide a brief overview. The PEG ratio compares the price to earnings (P/E) ratio of a business to its expected future growth rate (G); this period is typically five years, but any investment time horizon may be used. So here is the basic calculation:

\[
P/E ÷ G = \text{PEG ratio}
\]

The thinking goes that a P/E ratio, even a forward-looking one, only accounts for the growth in an earnings stream one year out. By incorporating the company’s expected growth rate for a longer period of time you supposedly get greater insight into whether or not it makes sense to buy an equity interest in a company. Just like a P/E ratio, the lower the PEG ratio, the less expensive is the equity.

Once you have calculated your PEG ratio the “rule of thumb” is that any company selling for a PEG ratio of less than 1.0x is selling at a discount. Any business selling for a PEG ratio of more than 1.0x is at a premium. A transaction price occurring at a 1.0x PEG ratio is considered fairly valued.

Importantly, the philosophy of, and mathematics of evaluating the PEG ratio are applicable to any price to generic ‘measure of cash flow’ as compared with the growth rate for that ‘measure of cash flow.’ In other words, you can compare a price to EBITDA ratio to the expected growth rate in the EBITDA and the philosophy and mathematics of evaluating still hold.

SHOULD I TRUST THE PEG RATIO?

Importantly, does the PEG ratio have any basis in reality and can you trust it? To both questions the answer is: sort of, but not really. In evaluating these answers, believe it or not, no subjectivity is necessary. How can that be?

PEG ratios are actually based on mathematics. Shockingly, the PEG ratio is only accurate under a very specific set of circumstances that are rarely ever met in the investment market place.

PRIVATE EQUITY CASE STUDY 1: Facebook

It has been reported that Facebook was valued at $50 billion\(^1\). This private equity valuation compares to Facebook’s first nine months of 2010 sales and earnings of $1.2 billion and $355 million, respectively. Since these figures are not for a full year we need to annualize them.

Assuming that Facebook’s fourth quarter 2010 growth rate in earnings is flat relative to the first nine months of the year is a conservative assumption. That assumption results in annualized 2010 sales and earnings for Facebook of $1.6 billion and $473.3 million.

\(^1\) http://www.ft.com/cms/s/2/a2935290-19dc-11e0-b021-001446eab49a.html#axzz1DV1SBqpw
In turn, those numbers give us a price to earnings ratio of 105.6x for Facebook, which will be used going forward.

If one were to invest in Facebook using the PEG ratio one would normally conclude that he needs at least a 105.6% earnings growth rate for five years to break even. This equates to a PEG ratio of 1.0x; P/E of 105.6x compared with 105.6% five year growth in earnings.

However, whether this is turns out to be true depends mathematically on a number of conditions being met.

First, Facebook actually has to deliver earnings growth for five years at a rate of 105.6%. Even assuming a 0.0% rate of return on reinvested earnings, Facebook in this scenario would generate a return to you of 106.3%. Frankly, a result that is not bad at all.

However, in the modern information era for a company to grow its earnings this fast every year for five years is highly unlikely. Such success would attract fierce competition from other businesses that would immediately dilute such miraculous profits. Think: the way Facebook usurped MySpace for social networking prowess.

In the public equity arena, that scion of growth, Google’s (GOOG) best five year CAGR performance in diluted earnings per share is 100.6%. Meanwhile, Apple’s (AAPL) best five year CAGR for diluted EPS is 137.4%. Is it possible that Facebook can match this kind of performance? Maybe. But there are other important assumptions to consider.

The majority of that 106.3% return is earned, not from actual earnings being paid out to you, but because I have assumed that Facebook’s lofty 105.6x P/E holds flat for the entire five years. This is a highly unlikely scenario. If I assume that Facebook’s multiple contracts just 5% per year for that five year investment time horizon then the return drops to 96.2%. Clearly a wonderful result, but that is a lower rate of return than the PEG ratio of 1.0x and its 105.6% embedded growth assumption would imply.

I have been assuming a 0.0% required rate of return on the part of the investor in these calculations. What happens if I assume Facebook’s multiple stays flat (an aggressive assumption), but that you have a 10.0% required rate of return? Your return in Facebook drops to 87.6%. Not bad, but definitely not 105.6%; in fact, you would underperform by 18.0% based on PEG ratio assumptions.

If you understand the dynamics of CAGR math then you know if you lengthen the investment time horizon that returns usually will increase. But if I lengthen the investment time horizon out to 10 years then the returns on Facebook actually decrease slightly to 87.3% from 87.6%. The reason is that when the required rate of return is lengthened out, it impacts the return dynamics of Facebook to a greater extent. More importantly, for this scenario to hold, a single dollar of earnings at the beginning has to grow to $1,349.68 at the end of year 10. I consider this to be an impossible feat.

Alright, the last objection might be, “Did you account for the reinvestment rate earned on Facebook earnings?” In the above examples no. That’s because I am holding all variables fixed, but one. So what if we now assume that Facebook reinvests its earnings at that initial earnings growth rate of 105.6%, and a 10-year time horizon? The result is a CAGR of 89.6%. Most of us would welcome that return, but in comparison to the understanding most of us have of the PEG ratio, it would have to be considered disappointing.

PRIVATE EQUITY CASE STUDY 2: Extended Stay America
Facebook is clearly an exceptional case where the mathematics of the PEG ratio strongly suggests a possible overpayment on the part of private equity investors in the social networking king. But the future is, of course, unknown and Facebook may turn out to deserve its current lofty valuation levels.

So let’s look at another private equity case study, Extended Stay America (ESA), whose various transaction details are a part of the historical record. That will allow us to further evaluate the PEG ratio and its potential dangers.

March 2004 Blackstone Group purchased ESA for $3.1 billion at a time when ESA’s earnings before interest and taxes plus depreciation and amortization (EBITDA) \(^2\) were $230.41 million\(^3\). This equates to a 13.45x price/EBITDA ratio, calculated simply as:

\[
\frac{3,100 \text{ million}}{230.41 \text{ million}} = 13.45 \text{x price to EBITDA}
\]

What if Blackstone ended up paying a 1.0x P/EBITDA/G ratio? Its return would be a paltry 7.85% if its required rate of return was equivalent to the ratio paid, or 13.45%. I am guessing that most private equity investors would be disappointed by this result.

So how did Blackstone Group fair with its purchase of ESA over the three years\(^4\) in which it owned the business?

In April 2007 Blackstone Group sold ESA to Lightstone Group for $8 billion at a time when the hotelier had raised EBITDA up to $545 million, a CAGR of 33.24%\(^5\). This equates to a purchase price/EBITDA on the part of Lightstone of 14.68x, or:

\[
\frac{8,000 \text{ million}}{545 \text{ million}} = 14.68 \text{x price to EBITDA}
\]

Blackstone’s return was approximately 42.49%, assuming a smooth growth in EBITDA each year and that EBITDA was reinvested at its implied CAGR of 33.24% each year. Most of this return was clearly generated, not from Blackstone’s ability to increase EBITDA, but its genius ability to turn that $314.59 million increase in EBITDA into a $4,900 million increase in total valuation! This represents a 15.58x incremental EBITDA multiple paid by Lightstone Group.

From the data we can backwards engineer that Blackstone’s initial P/EBITDA/G paid was a very low: 0.40x. Unfortunately, Lightstone Group did not fare nearly as well as Blackstone Group in its ownership of Extended Stay America. In fact, its purchase of ESA ultimately resulted in the single largest hotelier bankruptcy in the history of the United States.

The unswerving question is where did Lightstone make its mistake?

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\(^2\) Note: in the real estate business “net operating income” is used; however, this number is a close proxy for EBITDA

\(^3\) http://www.ehotelier.com/hospitality-news/item.php?id=A1408_o_11_o_M

\(^4\) Note: I am using a round number of three years in my calculations though Blackstone Group owned Extended Stay America for 3.10137 years. If you were to use the actual length of time, the CAGR would be 31.995%.

\(^5\) http://www.costar.com/News/Article/Hotel-Woes-Lightstones-Extended-Stay-Chain-Files-for-Bankruptcy/113004
One mistake was that it paid a 14.68x price to EBITDA multiple for ESA, and a 15.58x incremental multiple on EBITDA. If it was using a PEG ratio-style valuation, and it understood the dynamics of this rule of thumb, then it would know that it needed EBITDA growth over a three year time horizon well in excess of 14.68% in order to just break even.

Put frankly, Lightstone was very unlikely to consistently grow EBITDA beyond its April 2007 purchase date of ESA. The year 2007 was a time when nightly hotel room rates were already very high by historical standards and year over year growth in occupancy rates was already falling.6

Lightstone might have assumed that it would ultimately be able to find a buyer upon exit that would be willing to pay up for ESA in terms of a price/EBITDA multiple – the greater fool theory that worked for Blackstone.

However, assuming EBITDA stayed flat for three years, that multiple would have had to expand to 22.3x for Lightstone to earn that 14.68% return implied by a 1.0x P/EBITDA/G multiple. In an industry where a 9.0x capitalization rate (i.e. “cap rate”) was considered a normal purchase price, it would have been crazy to assume that a buyer would pay a cap rate almost 150% higher than normal.

Unfortunately, the real estate business, and its executives, when talking about value in their transactions frequently talk in terms of “cap rates.” Yet the majority of these same executives are probably using PEG-ratio style shorthand without understanding the dangers of using it (more on this in a moment).

The saga of Extended Stay American continues. In May 2010 ESA was bought by a private equity consortium including Centerbridge, Paulson, and (hello, again) Blackstone Group. The reported details of the deal were for $3.925 billion7 with an estimated EBITDA of $357.13 million.8

This equates to a price/EBITDA ratio of 10.99x, and is a mere 3.69x less than Lightstone paid (14.68x vs. 10.99x price/EBITDA):

\[
\left( \frac{\$3,925 \text{ million}}{\$357.13 \text{ million}} \right) = 10.99x \text{ price to EBITDA}
\]

What a difference that reduction of 3.69x in price/EBITDA valuation makes, though. The new group of ESA investors needs only a 9.1% CAGR in EBITDA in order to breakeven over a three year time horizon – which seems to be the time horizon appetite investors have for Extended Stay America.

Even if EBITDA remains flat for three years, the price/EBITDA multiple only needs to expand 3.64x to 13.63x for the consortium to breakeven. While much higher than a 9.0x cap rate, this multiple is very similar to what Blackstone originally paid for ESA back in 2004, or 13.45x. Also, this represents a kind of worst case scenario for the current consortium of owners.

The above mathematical results for Facebook and Extended Stay America may be a bit surprising. So why is it that the PEG ratio breaks down and is potentially so perilous?

**PRINCIPLE PROBLEMS WITH PEG RATIO-STYLE VALUATION SHORTHAND**

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6 http://3.bp.blogspot.com/_pMscxxELHEg/Scurn-QaskI/AAAAAAAAE5E/MMYXlZehKEs/s1600-h/HotelOccupancyRateMar262009.jpg
8 http://www.dbrs.com/research/236712/extended-stay-america-trust-series-2010-esh/rating-report-series-2010-esh.pdf ; page 9 has the estimated EBITDA of the transaction
1. The PEG ratio assumes that the multiple paid at the outset holds flat until sale. I think this is a considerable assumption, especially the longer you hold an investment. Generally high growth businesses eventually experience a slow down in earnings growth and a commensurate contraction of their multiple. In Facebook’s case, if you assume that their P/E falls from a lofty 105.6x to a more reasonable 35.0x in year five, then your rate of return falls to 68.98%. And if you have a required rate of return of just 10%, then your return falls to 54.47%. While impressive, if you were relying upon the PEG ratio as a valuation shorthand you would be sorely disappointed.

2. The PEG ratio makes no assumption for how the business or you reinvest earnings. For the returns implied by the PEG ratio to hold, the reinvestment rate of return must equal the initial assumed growth rate in earnings. This is often an overly aggressive assumption.

3. The PEG ratio doesn’t explicitly account for your required rate of return. Instead, it assumes that your required rate of return is 0.0%. Clearly this is an untenable assumption. In the Facebook example, if you assume just a 10.0% required rate of return, returns fall from 107.51% to 89.02%. If you assume a more private equity-like 40% required rate of return then the return in Facebook falls to 49.78%. Fantastic, except the result is far below the initial expectations implied by the PEG ratio.

4. The PEG ratio doesn’t factor in your investment time horizon. This clearly affects your ultimate realized rate of return.

5. Very importantly, the PEG ratio treats all PEG ratios as being the same, when in fact they are very different. For example, a PEG ratio of 1.0x can be generated by a 10.0x P/E combined with a 10.0% five year earnings CAGR, or a 100.0x P/E ratio combined with a 100.0% five year earnings CAGR.

In this case the return profiles are very different for the two different 1.0 PEG ratios. For the 10.0x P/E with 10.0% five year earnings CAGR, with a 5 year investment time horizon, a 10.0% reinvestment rate, and a 10.0% required rate of return, your actual CAGR is 10.0%.

Yet, for the 100.0x P/E with a 100.0% five year earnings CAGR, with a 5 year investment time horizon, a 100.0% reinvestment rate, and a 100.0% required rate of return, your actual CAGR is 5.55%. This is a dramatically different result.

The results are even more dramatic for a PEG of 1.0x generated by a 5.0x P/E, with a 5.0% five year earnings CAGR, a 5 year time horizon, a 5% reinvestment rate, and a 5% required rate of return. Here the realized CAGR is a whopping 16.05%.

The culprit is the time value of money. A P/E of 100.0x means that you are trading $100 for $1 of earnings. This is an exchange that you would likely not make at a Las Vegas casino. So that $1 of earnings has to grow very, very fast to make up for the disparity in what you paid at the outset to what you receive over the intervening years.

WHEN DOES THE PEG RATIO HOLD UP?

So in what very special case do you actually earn the same rate of return that the company does? That is, if I buy a private equity interest in Facebook wanting my rate of return to equal Facebook’s 105.6% earnings growth rate implied by a PEG ratio of 1.0x, how do I do that?

Unfortunately, the traditional PEG ratio heuristic of “companies are a value when the PEG ratio is less than 1.0x” focuses your attention incorrectly – it is close, but no cigar.

The two things you want to focus on are:
• All three rates of return involved in the investment are identical, and without any deviation. These three returns are:
  o The company’s earnings growth rate
  o The rate of return on reinvested earnings
  o Your required rate of return on the investment
• The unified rates of return, from just above, when multiplied by the P/E must total 1.0

An example will help to make this clear. If you pay a 20x P/E then fair value is when the company’s earnings growth rate, the rate of return on reinvested earnings, and your required rate of return all equal 5.0%. That is, fair value occurs here because 20 x 5% = 1.0. If these very special conditions are met, then your actual compound annual return will be identical to the three flows above, or 5.0%.

Likewise, if you pay a 30x P/E then the three rates of return must all be 3.33% (30 x 3.33% = 1.0). If this is the case, then your return will be 3.33%. When these stars all align then your investment time horizon is irrelevant because this result holds for all investment time horizons.

Very importantly, the PEG ratios for these two scenarios are very different even though they both are scenarios where the stock is fairly valued. In the 20x case, the PEG ratio is 4.0x, or 20x P/E ÷ 5% Growth; whereas in the 30x case, the PEG ratio is 9.01x. So we have fair value with a PEG ratio of 4.0x and also at 9.01x. This clearly violates the “fair value is when the PEG is 1.0x” rule of thumb.

Another way of stating all of this is: a business is fairly valued when all of the rates of return are all equal to the earnings yield of the business. The earnings yield is simply the inverse of the P/E ratio. So a 20.0x P/E business has an earnings yield of:

\[
1 / 20.0x = 5.0%
\]

We saw above that when all of the rates of return for the 20.0x business were all 5%, that is equal to the earnings yield, that the business was fairly valued.

So there is one, and only one, very special case in which the PEG ratio heuristic of “a 1.0x PEG ratio indicates fair value” holds up. That is when the rates of return are all 10.0% and the P/E paid is 10.0x. Here you have a PEG ratio of 1.0x, rates of return of 10% and the result is that you get exactly what you paid for: a 10% compound return. May you be so lucky to experience such a convergence.

It seems to me that somewhere in the deep, dark past of investing that the communication of the significance of the PEG ratio went awry. Does it make sense to compare the P/E to the earnings growth rate? Absolutely. Does the number 1.0 hold a special significance when using the PEG ratio? Absolutely. But on this latter point the focus is messed up. The 1.0 part of the relationship is that the P/E multiplied times the unified growth rate must equal 1.0; when this is the case there is fair value.

WHEN IS THE PEG RATIO DANGEROUS?

It should be obvious that the PEG ratio is dangerous almost always! It implies to the naïve investor that a business is a value when it is trading at less than a 1.0x PEG ratio. But this is patently false.

Standard interpretations of PEG ratios also imply that you will receive the same rate of return on your investment as the company you have invested in makes on their earnings. This is also patently false.
I have also demonstrated that PEG ratios just are not comparable. A 1.0x PEG ratio is not the same across situations. A company with a high P/E is especially dangerous when using the PEG ratio as an indication of value because the rates of return are much lower than implied by earnings growth rates.

WHAT DO I ADVISE?

I don’t advocate an abandonment of the thinking behind the PEG ratio, where the price you pay is compared to both current earnings and the growth rate in earnings. But I do advocate that you understand just what it is you are looking at when you use a PEG ratio.

So here are the new “rules of thumb” for PEG ratios (because, don’t you know, it’s slightly more complicated than this; however, these do hold much, much better than the traditional use of the PEG ratio as a valuation metric):

- A business is overvalued when the flows associated with it – its earnings growth rate and the reinvestment rate of its earnings – are less than its earnings yield and your required rate of return. For example, with a 20.0x P/E stock (like Apple), its earnings yield is 5.0% (1 / 20x P/E). If either the earnings growth or reinvestment rate is less than 5.0% then you are overpaying. But the business is also overvalued if your required rate of return is higher than both the earnings yield and the returns generated by the business. Thus, if your required return is 6.0% for a 20.0x P/E stock, paying 5% and reinvesting at 5%, then you are overpaying.

- A business is undervalued when the opposite above is true. So if the rates of return associated with the business are greater than the earnings yield then you are looking at an undervalued business. For the 20.0x, earnings yield of 5% business, if the rates of return are 6.0% then the stock is undervalued. This assumes of course that your expected rate of return is lower than, or equal to, the earnings yield of the business. To make money beyond your expectations your required rate of return has to be 5% or less.

But ideally you use PEG ratios only as a shorthand valuation measure until you can actually create a proper valuation model using that super computer sitting on top of your desk.