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A More Intuitive Formula for the PEG Ratio

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Abstract: This paper derives a new formula for the price-earnings growth (PEG) ratio, utilizing the insight from Mario Farina's original equation and Peter Lynch's assertion that for a stock to be fairly-valued, the PEG and earnings growth rate has to be the same. After deriving the new formula, I demonstrate how the new formula connects with the existing formulas and P/E Ratio. The new formula allows for more flexibility on growth rate assumptions for both earnings and price, is more intuitive, is easier to implement, and can be used to make predictions about future price and earnings growth with current price and earnings. The new formula addresses some of the concerns regarding the usefulness of the PEG Ratio.

Keywords: PEG ratio; value investing; investment valuation

1. Introduction

The price-earnings growth (PEG) ratio is one of the key valuation metrics for value style investing screening tools, and one of the most used tools among practitioners (Bradshaw 2004; Dukes et al. 2006). It is commonly attributed to Lynch (1989), though the origin can be traced back to Farina (1969). However, there is much confusion about how the ratio should be interpreted. There are two contributing factors to the confusion.

First, the growth rates used for the calculation of PEG ratio are different for Farina and Lynch. From Farina (1969), he is referring to the past growth rates. (Henceforth, I will refer to the PEG ratio using past growth rate as PEG_F.) Lynch (1989) explicitly suggests that it is the expected (future) growth rate that matters. (Henceforth, I will refer to forward PEG ratio as PEG_L). Farina's PEG ratio connects with low P/E in the past, whereas Lynch's PEG ratio connects with low forward P/E.

Second, there are no specific guidelines on how far back or forward in time an analyst should consider. Yahoo Finance uses the expected average 5-year growth rate from analysts covering the stock, NASDAQ uses the next 12 months, and some others suggest a 3-year time frame. Farina uses the last 4-year growth rate to demonstrate the usefulness of the ratio, but does not give a definitive answer as to what timeframe is considered appropriate. Another question is whether there are connections between the past growth rate and future PEG ratio? The current formulation does not provide any clear answer to any of the concerns mentioned above. Some analysts also criticize the measure for not being able to accommodate a company with either a higher growth rate or a negative trailing twelve-month EPS that is expected to become positive.

In this note, I propose a new formula for PEG ratio that can resolve some of the main concerns about the PEG ratio mentioned in the previous paragraph. I will show that the new formula can accommodate any growth rate assumptions, especially for extremely high growth rates and negative growth rates. I will also show the connection between the proposed new formula and the existing formula and how analysts can use the new formula to calculate past growth rates, the past PEG ratio, and the potential future growth rates based on the current PEG ratio. The new formula also has no restrictions on time horizon and can accommodate short-term earnings and price declines.

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The rest of the paper is organized as follows. Section 2 outlines the existing formulas and provides a brief summary of the empirical findings of the performances of the existing formulas. Section 3 derives the new formula. Section 4 demonstrates the usefulness of the new formula with both synthetic and empirical data. The paper concludes with a summary in Section 5.

2. The Original PEG Formulas

The original equation for PEG in Farina (1969) is:

$$PEG = \frac{Price/Earnings}{Average\ gain\ expressed\ as\ a\ decimal}$$

The denominator (average gain expressed as a decimal) is the average growth rate of earnings over a specific number of years. The example used in Farina (1969) is PDQ Express (a factitious company) with EPS of \$2.1 in 1964 and \$4.2 in 1968. Farina argued that growth of earnings was 100% over the 4-year period and thus with an average growth of 25%[1], with a P/E of 20, and with the PEG ratio being 80 for PDQ over the 4-year period. Thus, the stock is undervalued. Because the denominator is a decimal, the PEG value that prices a stock properly will have a value of 100 (in percentage). A value smaller than 100 is a bargain, whereas a value larger than 100 is considered expensive.

The PEG ratio commonly known in the financial literature is:

$$PEG = \frac{Price/Earnings}{Annual\ earning\ growth\ in\ percentage}$$

In this expression, the denominator is the expected average annual growth rate for earnings expressed as a full number (percentage). Thus, if the value of the PEG is less than 1, the stock is said to be undervalued, whereas with a PEG ratio greater than 2, the stock is said to be overvalued. Likewise, a stock with a PEG ratio between 1 and 2 is considered fairly valued.

The source of these three classifications, and the equation stated above, can be attributed to Lynch (1989):

> The P/E ratio of any company that's fairly priced will equal to its growth rate. I'm talking about growth rate of earnings here... If the P/E of Coco-Cola is 15, you'd expect the company to be growing at about 15 percent a year, etc. But if the P/E ratio is less than the growth rate, you may have found yourself a bargain. A company, say, with a growth rate of 12 percent a year (also known as a "12-percent grower") and a P/E of 6 is a very attractive prospect. On the other hand, a company with growth rate of 6 percent and P/E of 12 is an unattractive prospect and headed for a comedown. (p. 199)

In other words, a fairly-valued stock should have a PEG ratio of 1. A stock with a PEG ratio below 1 is a good prospect, a stock with PEG ratio of 0.5 is a bargain, and, on the other hand, a stock with a PEG ratio of 2 or greater is considered expensive and is likely headed for a price decline. The difference between Lynch's and Farina's interpretations of what is considered expensive is PEG values between 2 and 1. Lynch is more willing to give higher values for a company with high earnings growth potential going forward, whereas Farina is looking for companies with price growth lagging earnings growth.

The idea that stocks with a higher growth rate should command a high P/E ratio is not new. The Gordon (1959) Growth Model (GGM, and sometimes referred to as constant growth model) implicitly implies a higher forward P/E ratio for a company with a higher dividend growth rate.

$$GGM\ P/E = \frac{1-b}{r-g}$$

where b is the plowback (retention) ratio, r is the required return, and g is the dividend growth rate. Since dividend is assumed to be a constant fraction of earnings, higher dividend growth can only be possible with higher earnings growth.

While the PEG ratio may seem like a heuristic idea that adds marginal value to high P/E verse low P/E debate, the performance of the PEG ratio is quite remarkable. Khattab (2006) found that 92% of stocks with a PEG ratio below 1 in March of 2003 beat the market return over the next 3 years (ending in March of 2006). Stocks with a PEG ratio of 0 to 0.99 have an average return of 225.2%. Stocks with PEG ratio higher than 2 have only a 47% chance of beating the market, and an average return of 69.4%. Easton (2002) found that the forward growth rate implied by the PEG ratio is a good approximation for the actual forward growth rate. Moreover, stocks with high PEG ratios actually have downward biases on growth rate projection (thus, a PEG ratio higher than 1 might still be a good value). Bradshaw (2004) and Schatzberg and Vora (2009) also find PEG ratio-based strategies are superior to discount cash flow methods.

The impressive performances of the PEG ratio mentioned above notwithstanding, the concerns with the original formulas mentioned in the introduction should be addressed. In the next section, I will combine the GGM P/E and the original PEG ratio formula to come up with a more intuitive formula.

3. The New PEG Ratio Formula

Since Lynch (1989) suggests that a stock that is fairly-valued should have a P/E ratio similar to an expected earnings growth rate, the formula for PEG can be written as:

$$1 = \frac{{}^{Price}/_{Earnings}}{Annual\ Earning\ Growth} \tag{1}$$

So, the PEG ratio is related to a ratio of the price growth rate and the earnings growth rate. In order to avoid the limitations caused by arithmetic growth rate and time length constraints, we can use geometric growth relative for both the price and the earnings growth rate. To do so, we need to use the geometric growth relative:

$$PEG_C = \frac{1 + Price\ Growth\ in\ any\ given\ period\ in\ decimal\ form}{1 + Earning\ Growth\ in\ the\ same\ give\ period\ in\ decimal\ form} \tag{2}$$

We can simplify the formula as:

$$PEG_C = \frac{1 + P_g}{1 + E_g} \tag{3}$$

where 1 + P_g is the geometric growth relative for price and 1 + E_g is the geometric growth relative for earnings growth. The proposed new PEG ratio formula will give us the same implications as the existing PEG ratio formulas, namely:

1. If PEG_C is less than 1, the stock is undervalued because price growth has been lagging behind earnings growth, and, therefore, future price growth will outpace earnings growth.
2. If PEG_C is higher than 1, the stock is overvalued because price growth has been outpacing earnings growth, and, therefore, future price growth should be outpaced by earnings growth.
3. If PEG_C equals to 1, then the stock is fairly valued as the past earnings and price growth should be the same and will likely be so if the stock continues to be fairly-valued.

Equation (3) can accommodate past and future growth rates for both earnings and prices, and accommodate any time frames.

4. Applications and Analysis

4.1. Synthetic Values

To see how this new formula is similar numerically to existing formulas, we can start with a simple example. Suppose Company A has a price of $10 and an EPS of $1. The P/E ratio is 10. For a fair valuation, the growth rate expectation must be 10%. If the PEG ratio is to remain at 1 over the next 5 years, the price by the end of the fifth year will be $16.1 and the EPS will be $1.61. The P/E ratio will be 10 and the PEG ratio will be 1 by the end of the fifth year. You can use any earning growth rate assumptions, so long as the current PEG is 1, and draw the same conclusion. Table 1 displays the details.

Table 1. Price and Earnings Growth at the Same 10% Rate Over Five Years.

Period	0	1	2	3	4	5
Price	10					16.1051
EPS	1	1.1	1.21	1.331	1.4641	1.61051

Thus, for a fairly priced stock with a constant growth rate, PEG_F, PEG_L and PEG_C are the same.

What if the price over a given period remains the same while earning growths at 14.87% a year? If the stock starts the period fairly-valued, then the P/E had to be 14.87. We do not really need to know what the starting EPS is. We can use $1 for simplicity. If the growth rate is 14.87%, then by the fifth year, EPS would have doubled and the price would remain at $14.87. The P/E ratio by the end of fifth year would be 7.435, and with an earnings growth rate of rate of 14.87%, the PEG value will be 0.5. Table 2 provides the numerical results.

Table 2. Price Growth at 0% and Earnings Growth at 14.87% Over 5 Years.

Period	0	1	2	3	4	5
Price	14.87					14.87
EPS	1	1.1487	1.32	1.52	1.74	2.00
P/E	14.87					7.435
PEG	1					0.5

Using the new equation, we will arrive with the same value:

$$PEG_C = \frac{1+0}{1+1} = 0.5 \tag{4}$$

This the value of PEG_F.

What insights can we gain from this new equation? Using the value in Equation (4), if we assume that the earning growth rate remains at the same rate over the next 5 years, the PEG ratio for the next 5 years will have to be 2 for the entire 10-year period to have a PEG ratio of 1 (stock will be fairly valued over a 10-year period). In other words,

$$PEG_{C1} \times PEG_{C2} = 1 \tag{5}$$

where PEG_{C1} is the PEG ratio over the last 5 years and PEG_{C2} is the PEG ratio for the next 5 years. For PEG_{C2} to be at the value of 2, the price over the next 5 years will have to increase by 300%. The usefulness of the new equation is that it allows for any combination of earning and price growth rates, so long as it satisfies the condition that the PEG ratio for the next 5 years is 2. In this example, for a PEG value of 2, the price will have to increase from $14.87 to $59.48, with EPS increasing to $4 if the growth rate assumption remains the same. This gives a P/E ratio of 14.87 and thus a PEG ratio of 1 over a 10-year period. The following table (Table 3) shows the numerical outcomes.

Table 3. Price Growth Over the Next 5 Years with 0% Price Growth in Previous 5 Years.

Period	0	1	2	3	4	5	6	7	8	9	10
Price	14.87					14.87					59.48
EPS	1	1.15	1.32	1.52	1.74	2	2.3	2.64	3.03	3.48	4.00
P/E	14.87					7.435					14.87
EPSG%	14.87					14.87					14.87
PEG	1	0	0	0	0	0.5					1

What if the price over the last 5 years has been growing at a rate far higher than the earnings growth? If we assume that the price has been growing twice (in geometric relative) as much as the earnings over the last 5 years, the end of the 5-year period price will be \$44.61, with an EPS of \$2. This gives a P/E of 22.3 and a PEG ratio of 1.5. For the PEG for the entire period to be 1, the next 5-year PEG has to be 0.667. Assuming that the earnings increased to \$4 (100%) by the end of the next 5 years, the price has to increase only by 33.33% over the next 5-year period. The end price will, of course, be \$59.48. Thus, a P/E of 14.87 and a PEG of 1 is restored. The results are shown in the Table 4.

Table 4. Price Growth Rate is Higher Than Earnings Growth Rate in the First 5 Years.

Period	0	1	2	3	4	5	6	7	8	9	10
Price	14.87					44.61					59.48
EPS	1	1.15	1.32	1.52	1.74	2	2.3	2.64	3.03	3.48	4.00
P/E	22.305	0	0	0	0	22.305					14.87
EPSG	14.87	14.87	14.87	14.87	14.87	14.87					
PEG	1.5	0	0	0	0	1.5					1

The proposed formula also allows for negative price growth and any given time length. Consider a stock with PEG of 1 and P/E of 10 at the beginning of the period. By the end of the period, the PEG is 0.5, with EPS growth at 60% over the same period. Using the new formula, price growth over the same period had to be −20%. Numerically, if we start with price of \$10 and an EPS of \$1, the EPS by the end of the period will be \$1.6. If the price declined by 20%, the price will be \$8 at the end of the period, and the P/E will be 5 at the end of the period. At what annual growth rate would you obtain an EPS from \$1 to \$1.6? The answer is about 10% over 5 years. Therefore, the PEG will be 0.5 using the existing formula, which agrees with the new formula. Table 5 shows the numerical results.

Table 5. The Effect of Negative Price Growth.

Period	0	1
Price	14.87	11.896
EPS	1	1.6
P/E	7.435	
PEG	0.5	

From the numerical examples shown above, we can see that the conclusions we can draw from the new formula are the same as the existing formulas. However, the new formula improved upon the existing formula in that it shows what the earnings growth and price growth must be within the period that an analyst is considering. It also allows for any growth rate assumptions (including negative growth) so long as they produce the value needed to bring PEG_C to the desired level.

Another important question is does the ending or beginning value for PEG have to be 1 for the new equation to work? The answer is that it does not. We can generalize Equation (5) as:

$$PEG_m \times PEG_n = PEG_{m+n} \tag{6}$$

where PEG_m is the PEG ratio in period m, PEG_n is the PEG ratio in period n, and PEG_{m+n} is the PEG ratio for the combined (end) period. For example, if the ending PEG ratio is 0.9 and PEG_n is 1.5, then PEG_m has to be 0.6, and, so, an analyst who spotted a stock with a PEG ratio of 1 currently, looking back at the PEG ratio for the last 3- or 5-year period as having PEG ratio of 1.5, can deduce that the stock must have had a PEG ratio of 0.67 over the same time distance in the past (3 or 5 years ago). Note that using Equations (5) and (6), an analyst can feel comfort in recommending a stock with short term PEG near or even above 2, as long as the previous period PEG is near or below 0.5. Trombley (2008) and Schnabel (2009) show that firms with a low cost of equity and a high growth rate can have a PEG ratio above 1. A low cost of equity implies a higher forward growth rate potential. With the stock price growth lagging in previous years, it is only reasonable for the stock price growth to catch up in following period.

The proposed new equation also has another unique property: it connects the forward PEG and the backward PEG. Let us say that period *m* is time zero and the stock starts with a known forward PEG (P/E ratio at time 0 and forward growth rate). If the growth rate in PEG_L is the unbiased forecast of future growth rate, by the time we reached time *n*, we would have the backward PEG, which is PEG_F. Thus, we have:

$$PEG_F = PEG_L \times PEG_C \tag{7}$$

Equation (7) connects the Farina *PEG* ratio (backward *PEG*) and the Lynch *PEG* ratio (forward *PEG*).

Equation (7) can be further generalized. Since Equation (2) is a ratio of geometric return relatives, the generalized PEG is:

$$PEG_{CT} = \prod_{i}^{T} PEG_i \tag{8}$$

Whether you believe in Lynch's argument that *P/E* ratio and growth rate have to be the same, or that the market is efficient in the long run, the value of Equation (8) has to be 1 given long enough *T*.

What is more striking with Equation (8) is that it gives us a new way to calculate the PEG ratio without growth rate assumptions. Since Equation (8) is a product of geometric relatives in both the numerator and denominator, the equation can be simplified to:

$$PEG_{CT} = \frac{P_T/P_0}{E_T/E_0} = \frac{P_T/E_T}{P_0/E_0} \tag{9}$$

Equation (9) shows that the PEG_C ratio from time 0 to time *T* is simply the *P/E* ratio at time T divided by the *P/E* ratio in time zero. This can be generalized into any specific time length T. Consider a stock with a *P/E* ratio of 30, with a stock price of \$30 and an EPS of \$1. Assuming that the forward EPS growth rate is 20% for the next period (5 years), it would give us a PEG ratio of 1.5. Further, we can assume that the stock price growth rate is lower than the earnings growth at 15%. The following table (Table 6) shows the numerical results:

Table 6. The Connection Between the PEG Ratio and P/E Ratio.

Period	0	1	2	3	4	5
Price	30	34.5	39.675	45.62625	52.47019	60.34072
EPS	1	1.2	1.44	1.728	2.0736	2.48832
PE-0	30					
PE-5	24.24958					
PEG-PE	0.808319					
PEG-C	0.808319					

The EPS will increase to $2.49 and stock price will increases to $60.34. Thus, it gives us a P/E ratio of 24.25 in year 5. The PEG ratio calculated with the P/E ratios (PEG-PE) from the period is 0.808, the same as the result with the value obtained by applying Equations (3) and (9).

It is important to note that the PEG ratio in the fifth year in this example is 1.215, which is a little more than 1. For the 10-year period to have a PEG of 1, earnings will have to keep growing at a rate above stock price increases over the next 5 years. This is reasonable considering that the stock had a PEG of 1.5 in time 0. The ending PEG is 1.215, which is the product of 1.5 and 0.808 (the PEG for the 5-year period we considered), and is the outcome we can expect by applying Equation (6). If we assume that earnings can keep growing at 20% for the next 5 years, the EPS will be $6.19 by year 10. To have a P/E of 20 (thus giving us a forward PEG of 1), the stock price has to be $123.8 by year 10. The PEG ratio over the next 5 years will be 0.824. The product of the first 5-year PEG and next 5-year PEG gives us a 10-year PEG of 0.667, which, when timed with the initial PEG of 1.5, gives us an overall PEG of 1—-exactly the same as the outcome of applying Equation (5). Dukes et al. (2006) found that one of the most commonly used methods for valuating common stocks among practitioners is the current P/E ratio multiplied by the forward EPS. Equation (9) shows how such a valuation method can produce the PEG ratio.

What insight could an analyst take from this? We often think that a stock with high P/E might be a poor choice for long-term investment. However, the higher P/E is justified if the earnings growth rate is high enough and remains high for some time into the future. For example, if an analyst forecasts that a company currently has a P/E of 10 and has a forward EPS growth rate of 20%, the PEG ratio is 0.5. This would mean that the P/E ratio in 5 years would be 5. Let us assume that the company has an EPS of $1, thereby giving us a current price of $10. The growth rate forecast would imply an EPS of $2.49 in year 5, which would imply the stock price to be $12.45 in 5 years. That is highly unlikely given that the company's growth rate is at 20%. Therefore, the stock price would have to increase to $24.49 a share for the P/E ratio to be 10 by year 5. However, at a P/E ratio of 10 and a growth rate of 20%, the PEG ratio will remain at 0.5. Therefore, the stock price growth figure can be adjusted upward. If we take the assumption that a PEG ratio between 1 and 2 is a fair value, the stock price could have a range of $50 to $100. This would mean that the stock price could increase anywhere between 400% and 900%, and the stock can still be fairly valued. It could also mean that the 5-year PEG ratio could be between 2 and 4, if the previous PEG ratio is 0.5. Conversely, if a stock that has a current P/E of 40 and a PEG ratio of 2, it would imply that the future P/E has to be 80 at the end of the timeframe. This P/E ratio would put the stock in a highly speculative range.

4.2. Industry Examples

4.2.1. Unusually Large Value for Earnings Growth

The last example mentioned above also shows another advantage of the proposed new formula: it can accommodate unusually high growth rates. With a price growth of 400% to 900% in a 5-year period, it would require a P/E ratio of a similar value for the old PEG formulas to work. For mature companies that experience periods of a high growth rate, they will not have the high P/E ratio to match the high growth rate. Thus, the PEG ratio will be completely off. However, the formula proposed in this paper can handle any growth rates.

Let us consider a real-world example. LRCX had an EPS of $6.3 in the fiscal year 2014 and an average stock price of $72 near the end of the fiscal year. It had a P/E ratio of 11.43. By the fiscal year of 2019, the company had an EPS of $14.6, a 5-year geometric growth rate of 18%. The $\mathrm{PEG_F}$ ratio value is 0.63 during that period. The stock price in October of 2019 was $280 a share, implying a P/E ratio of 19.18. The $\mathrm{PEG_C}$ ratio in October of 2019 was 1.07. The cumulative EPS growth during that 5-year period was 132%, while the stock price cumulative growth was 289% (LRCX started to pay a dividend in 2017, so this figure will be higher when adjusted for dividends). The stock price was increasing at a rate more than twice the stock price, yet the PEG_C ratio still implies LRCX a value stock (below 1). The main question is whether investors/analyst foresaw the rapid growth rate of LRCX earning? In the fiscal year of 2010, LRCX had an EPS of $2.73. So, the geometric growth rate from the 2010–2015 period was 18%. The company's stock price was $46 at the end of the fiscal year of 2010, which implies a price growth of 9.4%. The P/E ratio in 2010 was 16.85. With a forward growth rate of 18%, LRCX had a PEG ratio below 1 in 2010. However, by 2014, the *PEG* ratio dropped to 0.63 due to rapid a EPS growth relative to stock price growth (PEG_C ratio between 2010 and 2014 was 0.65, and the price increased by 150% and EPS by 230%). So, the price increase between 2014 and 2019 was simply the company's stock price catching up with the EPS growth. From the fiscal year of 2019 to 2021, EPS growth was at about 100%, which was about the same as the price growth ($560 per share), giving us a PEG value of 1. This would imply that the price of LRCX is at most fairly valued. It could go to as high as $1120 a share and still have a PEG below 2.

How does the performance of the proposed formula compare to the exiting formulas? Let us assume that the 18% EPS growth rate can continue for another 5 years, which would mean that by 2024, the company would have an EPS of $33.4 a share. Using the proposed formula, we can form a better idea of what the potential price range could be for LRCX, since the geometric growth relative to the earnings will be 12.23 between 2010 and 2024. To achieve a PEG_C ratio of 1, the price has to increase at the same multiple, from $46 a share to $562.78 a share, about double the current price of $280 a share (the first draft was written in November 2019, when LRCX was trading for $280 a share). Even at $562.78 a share, the company's stock would still be considered a value stock since the PEG_C ratio would still be at 0.94, according to Equation (6). If we take the average of 1 and 2 and a PEG ratio of 1.5, the price could be as high as $844 a share, and the company's stock would still be considered fairly valued (LRCX has an average stock price of $600 over the 2021–2022 period). This would imply a price growth of about 18 times over 15 years. According to Farina's formula, the P/E ratio for LRCX has to be in the 100+ range. LRCX never achieved an average P/E above 50 during the last 12 years. According to Lynch's formula, the P/E ratio has to be below 20 (since the forward growth rate is 18%) for the stock to be considered fair value. Again, LRCX never achieved an average P/E of below 20 over the last 12 years. Therefore, one would conclude that LRCX is an expensive stock according to Lynch's formula, and that it is an ultra-cheap stock according to Farina's formula. However, according to the proposed formula, the price of LRCX is considered a fair value between $560 and $1120. The price of LRCX reached above $800 a share by late 2021.

4.2.2. Negative Earnings and Price Growth

Perhaps the most useful application of the proposed formula is it can accommodate negative growth rates. In 2014, Exxon Mobile (XOM) stock was trading for $100 a share. Five years later, it was trading for $76 (−24% return). During the same period, the EPS went from $7.37 to $4.88 (−33.79% EPS growth). By plugging these numbers into Equation (3), we obtain a PEG_C value of 1.15 for XOM. For a company with a negative EPS growth, a PEG ratio above 1 seems expensive. The price for XOM continued to decline to as low as $33 a share by late 2020. With an estimated EPS of $3.36 for the fiscal year of 2019 (reported in the middle of 2020), the resulting PEG for XOM was 0.72, making XOM a value stock by definition. By the beginning of 2022 (before the oil price shock caused by Russia's invasion of Ukraine), XOM stock price recovered to $80 a share.

5. Conclusions

In this paper, I have proposed a new formula for the PEG ratio. The new formula is more intuitive and can accommodate any growth rate assumptions for price and earnings growth without time constraints, and it can yield the same conclusions and the same results as the existing formulas. The Farina and Lynch PEG ratio formulas vaguely suggest that forward price growth will have to be higher than price growth if the PEG value is less than 1 currently, and vice versa. They give no clear indication of how price might have changed relative to earnings growth in the previous period. The proposed new formula clearly shows that a stock with a high PEG ratio is likely a result of the stock price growing at a rate much higher than earnings in the previous period (Farina's original equation). Likewise, stock with a low PEG ratio is a result of earnings growth outpacing stock price increases in the previous period. The tendency for PE ratio to converge to the average, as found in the results of many studies in Dreman (2012), means that low PEG ratio stocks will likely see a higher price increase over the next period, and that high PEG ratio stock will see stock price increases at a rate lower than earnings growth (Lynch's insight).

The new formula can also be applied backward and forward, and is thus more flexible than the existing formulas. The new formula can also be easily adopted with a mix of price and earnings information (price growth and market cap growth is the same, and EPS growth and earnings growth must be the same), as well as allowing extreme values for earnings growth and negative earnings growth, making the calculation of the PEG ratio easier. The proposed formula also allows for calculation of PEG without growth rate information by simply utilizing the current and previous period's P/E ratio. An analyst can plug in various earning growth rates and price growth rates and see if the outcomes seem reasonable.[2] Since the numerical values one can derived from the proposed formula are the same as the existing formula, all the empirical evidence for the usefulness of PGE ratio are valid for the proposed new formula.

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Notes

1 This is a minor error. What Farina found was a geometric growth of 100% over a 4-year period. Annually, the growth rate required to achieve 100% over 4 years in only 18.92%. Therefore, the PEG ratio for PDQ is actually a little above 100 (105.71 to be exact). However, his insight is clear. While I derived my formula with geometric growth rates independently (I obtained an electronic copy of the paper containing the original equation from the author in March 2019), it is good to know that the author of the original equation had geometric growth in mind. I also hope that this paper can serve the purpose of properly attributing Mr. Farina (who passed away in May 2022 at the age of 98) as the original creator of the formula.

2 I thank Grant Glenn, CFA, CFP, at Noble Wealth Management for this important insight.

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