Growth and Forward EP

WEIHUAN ZHAI

MPhil

The Hong Kong Polytechnic University

2020

The Hong Kong Polytechnic University

School of Accounting and Finance

Growth and Forward EP

Weihuan ZHAI

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Philosophy

May 2020

CERTIFICATE OF ORIGINALITY

I hereby declare that this thesis is my own work and that, to the best of my knowledge and belief, it reproduces no material previously published or written, nor material that has been accepted for the award of any other degree or diploma, except where due acknowledgement has been made in the text.

_____ (Signed)

Weihuan ZHAI (Name of student)

Abstract

This paper explains forward earnings-to-price ratio (forward EP) from the growth perspective. The practical investment focuses on forward EP as it is a starting point to analyze whether investors over-pay for firms' future earnings. While, without understanding what growth is and how growth explain forward EP, investors are hard to assess whether forward EP is reasonable. Two growth measures are used in this paper. The first one, forward sales growth, captures firms' operating growth opportunities. It is calculated by analysts' consensus forecast sales, year t+2 relative to the forthcoming year t+1. The second one, book-to-market ratio, reflects both growth concept and application of accounting conservatism. Two growth measures are correlated with forward EP and similar in all 14 years. Two growth variables are mutually supporting: high forward sales growth implies a high (positive) BTM - EP correlation and low BTM implies a high (negative) forward sales growth - EP correlation. One special case of conceptual interest explicates growth irrelevance. First, when the book-to-market ratio approximates to 1, forward sales growth loses its explanatory power because the mark-to-market accounting discounts any benefits of positive NPV projects. Surprisingly, there is no evidence to show that risk can explain forward EP.

Keywords: Forward EP, Forward sales growth, BTM

Acknowledgements

I would like to express my sincere thanks to helpful guidance, comments from Professor James Ohlson and Dr. Jing Zhao. Any errors are my own.

Table of Contents

1. Background and Overview

Investment practice focuses on forward earnings-to-price ratio[1] (forward EP) because forward EP tells us how much investors are willing to pay per dollar of forward earnings. Then investors would consider whether the price for future earnings is reasonable. In other words, whether a forward EP is reasonable. To answer this question, it is necessary to understand the determinates of forward EP. Textbooks, e.g. Penman (2013) and Ross, Westerfield, and Jordan (2010), and practices universally point that growth can affect forward EP. Nevertheless, there is no agreement about what growth exactly is and no clear understanding how growth explains forward EP. Besides the growth factor, accounting conservatism must play a role as the numerator of forward EP – forward earnings depend on accounting conservatism. In other words, one cannot simply refer to the growth in bottom-line variables such as earnings, dividends, and book values, or some combination thereof, and then proceed by estimating the "growth-parameter". As Penman (2013) underscored, accounting principles should not be disregarded in explaining forward EP ratio because accounting numbers are not unavoidable to be affected by the idiosyncratic application of firms' accounting conservatism. By identifying forward sales growth and Book-to-market ratio, this paper addresses how growth explains forward EP with an emphasis on the role of accounting conservatism in understanding forward EP.

Theoretical models universally explicate that forward EP correlates with growth. In specific, Gordon – Williams model[2] shows forward EP is a function of cost of equity, growth, and pay-out ratio. Given the fixed cost of equity and full pay-out, dividends growth implies earnings growth,

[1] This paper discuss forward EP not forward PE is because forward EP can avoid zero denominator issue.

[2] $p(t)=k*eps(t+1)/(r-g)$ where $p(t)$ is stock price, k is pay-out ratio, $eps(t+1)$ is earnings per share in year $t+1$, r is cost of equity, and g is dividends growth. So, forward $EP=eps(t+1)/p(t)=(r-g)/k$.

and forward EP decreases with earnings growth increase. The residual income model[3] (Ohlson 1995) explain stock price via the aggregation of book value and the present value of abnormal earnings growth. Given the cost of equity, book value, and eps(t+1) are fixed, the increase in abnormal earnings growth implies a higher price. After considering the fixed eps(t+1), forward EP is relatively lower. Textbooks, e.g. Penman (2013) and Ross, Westerfield, and Jaffe (2010), conclude that high present value of future growth opportunity lower forward EP.

The above discussions suggest that growth, such as earnings growth, dividends growth, abnormal earnings growth, etc, apparently determinates forward EP. While, in investment practices, there is no agreement on what growth is. Since forward EP reflects forward earnings growth, it is easy to consider the short-term earnings growth (STG) and long-term earnings growth (LTG) to explain forward EP. However, empirically, STG, and LTG are problematic growth measures. In specific, the negative and small denominator makes STG unmeaningful. Even use analyst consensus forecast earnings, this problem still present, especially for loss firms. Some papers use the absolute value of analyst earnings forecasts as the denominator to avoid the negative issue, for example, Da and Warachka (2011). However, the absolute denominator still hardly avoids making STG meaningless. LTG has been left out due to its commonly perceived low quality and extreme upward bias, see Da and Warachka (2011), Sharpe (2005). Beyond this flaw, the unobservable ex-post value also makes LTG useless in decision making because expected LTG is rarely regarded as a fair growth metric without compared with ex-post LTG.

This paper identifies the two forward-looking growth measures – forward sales growth and book-to-market ratio (BTM). The first one focuses on traditional economic growth. It acts as a key driver

[3] P(t)=bv(t)+(eps(t+1)-r*bv(t))/(r-g) where p(t) is stock price, bv(t) is book value, eps(t+1) is earnings per share in year t+1, r is cost of equity, and g is abnormal earnings growth.

of balance sheet and income statement growth. Another benefit of forward sales growth is that it neutralizes financial activities, so we can observe the effect of operational expansion on forward EP without the intervention of financial activities. As operational expansion casts future growth opportunities and expected earnings, forward sales growth can effectively explain forward EP.

The second growth measure – book-to-market ratio (BTM), is well-known in literature and textbooks. Lower BTM implies higher growth opportunities, thus stocks with lower BTM are classified as a growth stock (e.g., Penman 2013; Ross, Westerfield, and Jordan 2012). Theoretically, BTM is a function of roe, growth, and cost of equity, e.g., Ohlson 1995. With the increase in growth, BTM decreases. The empirical evidence also supports the connection between BTM and growth. In specific, Harris, and Marston (1994) show the connection between BTM and long-term earnings growth. Penman (1996) shows the negative correlation between BTM and future residual income growth.

Beyond the growth concept of BTM, BTM casts the idiosyncratic application of conservative accounting. Lower book-to-market ratio implies an increase in conservative accounting, as documented by Feltham and Ohlson (1996); Penman (2013). When BTM is approximate to 1, mark-to-market accounting is applied. Hence, studying the effect of BTM on forward EP can help to explore the role of accounting conservatism.

Another unavoidable issue in explaining forward EP focuses on two numerators, analysts' consensus forecast earnings for the forthcoming t+1 year and t+2 year – eps(t+1) and eps(t+2). This study uses eps(t+2) as the numerator because lower cross-sectional variation[4] makes eps (t+2) more closely connects with valuation. As Johannesson and Ohlson (2020) found, the valuation

[4] eps(t+2)/price has a standard deviation of 2-3%, compared with 5-7% of eps(t+1)/price, see Liu, Nissim, and Thomas (2001) and Chan, Karceski and Lakonishok (2003).

model[5] using eps (t+1) has a lower goodness-of-fit than that using eps (t+2). To understand whether a stock price is fair, the starting point should anchor on a closely value-related metric. Hence, eps (t+2) is preferable as the numerator of forward EP.

Empirically, to obtain high-quality forecasts, we use S&P 500 firms, from 2001 to 2014, a total of 14 years. Forward sales growth is analysts' consensus forecast sales, year t+2 relative to the forthcoming year t+1 and then minus 1, (sales(t+2)/sales(t+1)-1).

Our findings can be summarized as follows:

i. Consistent with our hypothesis, both forward sales growth and book-to-market ratio materially correlate with forward EP ratio. The rank correlations hold in all 14 years.
    i) The average rank correlations between forward sales growth and forward EP is -0.32. While controlling for BTM, adding forward sales growth does not materially increase the explanation to forward EP. Basically, the median value of an increase in rank correlation between forward EP and fitted value by adding forward sales growth -- 0.04 is quite weak, even though the increase in rank correlation is positive in all 14 years.
    ii) The median value of rank correlations between book-to-market ratio and forward EP is 0.39. Additionally, controlling for forward sales growth, the incremental explanatory power of BTM is materially meaningful. The increase in rank correlation between forward EP and fitted value by adding BTM is positive in all 14 years and the median value of increase is 0.14. As book-to-market ratio connects with the idiosyncratic application of accounting conservatism, the incremental

[5] Valuation models: price=m1*eps1 vs price=m2*eps2. M1 is median price/eps1 across firms and m2 is median price/eps2 across firms.

explanatory power of BTM explicates the material effect of accounting conservatism in explaining forward EP.

ii. Forward sales growth and book-to-market ratio are mutually supportive.

   i) When book-to-market is in the bottom 20%, the average rank correlations between forward sales growth and forward EP increases to 0.44.

   ii) When forward sales growth is in the top 20%, the average rank correlations between BTM and forward EP increases to 0.41.

iii. Growth can be irrelevant in a special case.

When book-to-market is approximate to 1 (mark-to-market accounting), forward sales growth cannot explain forward EP.

iv. Surprisingly, there is no evidence that risk, such as beta, idiosyncratic risk can explain forward EP.

This study makes several contributions. First, this paper emphasis what role Accounting principle plays in understanding forward EP. The effect of accounting principle centers on the accounting conservatism. Ross, Westerfield, and Jaffe (2010) state firms following conservative accounting practices will likely have a high PE ratio. This point assumes that the market sees through differences in accounting treatment. While, it is not clear how conservative accounting affects forward EP, especially considering growth. I document conservative accounting combined with growth imply deferred earnings and in turn, lower forward EP. The mutually supportive effect compensates that conditional on growth, the quality of future earnings by application of conservative accounting, or the quantity of future earnings by mean-reverting of conservative accounting effectively decrease forward EP. Additionally, mark-to-market accounting affects the

effectiveness of forward sales growth as it discounts any benefits of positive NPV projects. In such a case, forward sales growth becomes irrelevant no matter in explaining forward EP.

Second, I extend the understanding of how BTM explains forward EP. Even though BTM is a well-known growth measure in previous literature (e.g., Penman 2013; Ross, Westerfield, and Jordan 2012; Harris, and Marston 1994, et al.) and it seems quite obvious that BTM can explain forward EP, it is not clear what growth exact is in BTM and except growth channel, whether and how BTM affect forward EP. On the one way, BTM cast the forward sales growth. On the other hand, conditional on forward sales growth, BTM captures the effect of conservative accounting so that it explains forward EP. This argument is empirically shown in mutually supporting effect.

2. Hypothesis Development

As discussed in the introduction, forward sales growth and book-to-market ratio (BTM) are employed as growth measure to explore how growth explain forward EP. The first one, forward sales growth casts on traditional economic growth. In other words, forward sales growth is a leading indicator of future operational business expansion. It acts as a key driver of balance sheet and income statement growth. This approach neutralizes the financial activities in firms' business expansion and turns the focus on the growth of expected operating earnings insofar as the expected profit margin remains stable.

Forward sales growth contributes to forward EP in two ways. One is that sales growth corresponds to earnings growth given a constantly expected profit margin. In other words, under the condition that the expected profit margin does not change, the forward sales growth boosts the perceived presence of forward earnings. To some extent that the sales growth expectation extends beyond the forward EP ratio's numerator period, t+2, the continuous profits in the future would make investors pay much more for current stock, insofar as lower forward EP ratio. The other way is through the present value of future growth opportunities. Consistent with the intuition that firms' business growth builds on the expected positive NPV projects in the future, high forward sales growth implies a higher present value of future growth opportunity. As forward EP is low in firms with a higher present value of future growth opportunity, forward sales growth connects with forward EP. Collectively, I hypothesis that forward sales growth correlates negatively with forward EP ratio. To conveniently compare with our second growth measure, we use the inverse value of sales growth – sales(t+1)/sales(t+2), named as ISG. In other words, ISG is positively correlated with forward EP ratio.

H1: forward sales growth correlates negatively with forward EP ratio.

The second growth measure – book-to-market ratio (BTM), explains forward EP from a conceptually interesting way. BTM can be viewed as a measure of the extent to which future expected cash flows have been "deferred" in terms of earnings recognition. Specifically, low BTM indicates conservative accounting combined with high sales growth. Two conditions imply past economic earnings[1] exceed past realized earnings. The exceed the part of economic earnings is due to the expected realized earnings in the future. In other words, realized earnings are pushed to the future: that is "deferred" earnings. The lower the BTM, the greater this deferred effect. With this deferred effect extrapolates beyond the near term, more earnings in the future will be recognized. It pushes forward EP decrease.

As low BTM has a relatively higher possibility to increase than to decrease, investors have to consider the potential effect of such a mean-reverting characteristic of BTM on forward EP. Whenever a low BTM becomes less low in the future, ether sales growth slows down or the accounting becomes less conservative. Both cases would accelerate the recognition of earnings in the future. Consequently, forward EP would decrease.

Additionally, BTM connects inversely with long run (average) profitability. Higher profitable firms are expected with the presence of more positive NPV projects, so low BTM implies more expected growth opportunities. As forward EP is low with the increase in the net present value of future growth opportunity, low BTM correlates with low forward EP. In other words, lower BTM, more positive NPV projects in the future, lower forward EP.

Collectively, I predict that:

[1] A setting in which mark-to-market, or "fair value" accounting is applied, Economic earnings can be viewed as change in value adjusted for dividends.

H2: book-to-market ratio correlates positively with forward EP ratio.

Nevertheless, if BTM approximates to (or more than) 1, the mark-to-market accounting would discount any benefits from future positive NPV projects. Consequently, BTM cannot connect with investment in a positive NPV project, and thus forward EP. So, there is no guarantee that the empirical results will play out as hypothesized. This argument relates to further growth irrelevance hypotheses.

As BTM also correlates with forward sales growth, it is reasonable to ask how the interaction between these two growth measures affect forward EP. To address this question, next I discuss the effect of one growth measure on forward EP conditional on the other growth measure. In other words, I examine the correlation between forward EP and BTM (or forward sales growth) controlling different levels of forward sales growth (or BTM).

Specifically, lower BTM implies the application of conservative accounting. If the accounting becomes less conservative, the growth in earnings will be magnified by growth in sales. In other words, conservative accounting leaves room for earnings growth. Once accounting becomes less conservative, the recognition of earnings would improve. Adding the high sales growth, earnings recognition would speed up, leading to much lower forward EP. If conservative accounting is consistently applied beyond the current period, higher quality of earnings would make earnings growth more valuable. In this case, higher forward sales growth corresponds to more quality earnings in the future. It pushes forward EP lower. Collectively, in a case with low BTM, the correlation between forward sales growth and forward EP is stronger.

H3a: when forward sales growth is high, for example: in the top 20%[2], the explanatory power of book-to-market ratio increase

Symmetrically, when forward sales growth is high, the deferred earnings effect of low BTM is magnified. So, the forward PE is much lower. To be specific, as documented before, low BTM implies the combination of high growth and the application of conservative accounting. This combination leads to high economic earnings but low realized accounting earnings because some accounting earnings are deferred to the future. If growth is expected continuously high, this deferred effect is stronger, so that much lower forward EP.

H3b: when book-to-market ratio is lower, for example: in the bottom 20%[3], the explanatory power of forward sales growth increases.

Collectively, forward EP is more sensitive with forward sales growth when BTM is lower and symmetrically, forward EP is more sensitive with BTM when forward sales growth is high.

So far, growth, no matter forward sales growth or BTM has shown that its power in explaining forward EP. While, to explore how growth explain forward EP, it is necessary to consider whether, under some cases, growth could be irrelevant.

As the application of the accounting principle could affect forward EP, I consider the situation in which a firm adopts mark-to-market accounting. In this case, book-to-market ratio approximates 1. It means the accounting per balance sheet has discounted all future benefits, involving the benefits of forward sales growth. In other words, as any benefits from forward sales growth are not booked in balance sheet, they are also not priced in stock value. Consequently, the forward

[2] It is arbitrary to use top 20%. One can also try to use top 15% or 25%. This classification is just used to consider the case in which BTM is low.
[3] Similar with note 7, this classification is inevitable to be arbitrary.

EP is irrelevant to forward sales growth with the application of mark-to-market accounting. So, I hypothesis that:

H4: when the BTM approximates 1 (or more), the forward sales growth could not explain forward EP.

3. Empirical analysis

3.1 Data and variable definition.

The sample includes S&P 500 firms, from 2001 to 2014, a total of 14 years. We choose S&P 500 firms but not all firms in IBES because analysts' forecasts in non-S&P 500 firms are known as low-quality data. Estimation quality depends on the quality of inputs. So, S&P 500 firms are preferable. The relatively short sample period allows us to show results for each year, in addition to averages. Such details could help readers to make up his/her assessments about the stability of results across years.

With the changes in S&P 500 index over time, our yearly samples change in terms of constituent firms, but the size remains almost constant.

Analysts' consensus data, such as eps(t+2), sales(t+1), sales(t+2), and price data come from IBES summary and CRSP, respectively. To avoid concerns that different fiscal year-end may mess the analyze in some ways and to make the book value information available in forecasting points, we use the analysts' consensus median forecasts revealed in the first month after the earnings announcement. The analysts' consensus median forecasts for t+1 year and t+2 year are eps(t+1)/sales(t+1) and eps(t+2)/sales(t+2), respectively. To make price and forecasts are more comparable, stock price, the denominator in forward EP is selected as close as to the consensus forecasts revealed day. In specific, if the stock price on the consensus forecasts revealed day is not available, we use stock price after the consensus forecasts revealed day but no more than one month later to make sure price and forecasts don't have too much information gap due to time difference. As mentioned previously, forward EP equals eps(t+2) divided by stock price and forward sales growth, SG, equals to the difference between sales(t+2) and sales(t+1), scaled by sales(t+1). Book-to-market ratio is book value in year t divided by stock price. Book value is from

COMPUSTAT. As low book-to-market ratio indicates high growth, we use the inverse of forward sales growth, ISG, to compare with BTM more conveniently. Risk is the average of standardized BETA and standardized idiosyncratic volatility, IVOL. Beta and idiosyncratic risk both are calculated from the capital asset pricing model. In specific, Beta is the coefficient of excess return and idiosyncratic risk is the standard error of residuals in the capital asset pricing model.

Table 1 shows descriptive statistics for each variable in different forward EP groups. In terms of forward EP ratios, the median value increases from 0.04 to 0.12 from the lowest to highest forward EP group. Compared with the cost of equity, 9% and 12% median of forward EP in groups 4 and 5 are quite higher, showing that firms in these two groups are not quite profitable. In the highest forward EP group, the 25th quartile and 75th quartile is 0.11 and 0.16, respectively. This high spread is because unprofitable firms tend to be volatile. The higher spread of forward EP also indicates the high cross-sectional variation in the highest forward EP group.

Turning to forward sales growth, SG, from lowest to highest forward EP group, it starts from 9% median to 6% and then flats at 5%. To some extent, this trend in SG shows the connection between forward EP and SG. And the connection is much clear in the lower forward EP group. Besides, that higher forward sale growth correlates with a higher risk has been well known in many textbooks and practical investment. As shown in the lowest forward EP group in which forward sales growth is quite high, firms have the highest BETA and idiosyncratic risk, IVOL. It applies to 25quantile, median, and 75 quantiles of BETA and IVOL. The highest spread of SG in the lowest forward EP group also indicates the existence of extremely high SG firms. We also can see that more than 25% of observations in this group have more than 15% forward sales growth. So, the high forward sales growth dominates risk in explaining the low forward EP.

Book-to-market ratio, BTM, shows the same decrease trend with forward EP from lowest to the highest group. This trend echoes with our hypothesis 2 that BTM positively correlates with forward EP. From the lowest to highest group, the median value is 0.3, 0.33, 0.43, 0.57, and 0.77. The spread of BTM in the highest group is clear high. 25th quartile and 75th quartile of BTM are 0.45 and 1.26, respectively. This high spread of BTM is because unprofitable firms are volatile.

From lowest to highest group, BETA declines first and then increase. The median value drops from 1.14 to 0.86 and then rise to 1.11. This noticeable U shape confirms that useless of risk in explaining forward EP. Another risk measure, idiosyncratic risk, IVOL, shows a similar U shape with a flatter curve.

Table 1. Descriptive Statistics

Summary statistics for all S&P 500 firms from 2001 to 2014. Our dataset contains 6127 firm-year observations. Firms are classified into different forward EP groups according to the ranking of forward EP in each year. Forward EP equals eps2 divided by stock price and forward sales growth, SG, equals to difference between sales2 and sales1, divided by sales1. Book-to-market ratio is book value in year t divided by stock price. Beta and idiosyncratic risk –IVOL, both are calculated from capital asset pricing model.

Forward EP groups	N	Variable	25th	Median	75th
		Forward EP	0.03	0.04	0.05
		SG	0.05	0.09	0.15
Lowest	**1220**	**BTM**	0.17	0.30	0.55
		BETA	0.71	1.14	1.80
		IVOL	0.06	0.09	0.12
		Forward EP	0.06	0.06	0.07
		SG	0.04	0.06	0.09
2	**1228**	**BTM**	0.21	0.33	0.58
		BETA	0.53	0.90	1.29
		IVOL	0.05	0.07	0.09
		Forward EP	0.07	0.07	0.08
		SG	0.04	0.05	0.08
3	**1231**	**BTM**	0.27	0.43	0.75
		BETA	0.53	0.86	1.21
		IVOL	0.05	0.07	0.09
		Forward EP	0.08	0.09	0.10
		SG	0.03	0.05	0.07
4	**1225**	**BTM**	0.37	0.57	0.88
		BETA	0.56	0.90	1.30
		IVOL	0.05	0.07	0.09
		Forward EP	0.11	0.12	0.16
		SG	0.02	0.05	0.08
Highest	**1223**	**BTM**	0.45	0.77	1.26
		BETA	0.60	1.11	1.51
		IVOL	0.06	0.08	0.10

The next section considers the bivariate correlations among forward EP, forward sales growth, nook-to-market ratio, and risk.

3.2 Preliminary Data Analysis

In this section, I do rank correlations to examine the effects of two growth measures, forward sales growth, and BTM on forward EP, mutually supportive effect, and growth irrelevance effect. I do not involve spearman correlation is because rank correlation is a stricter metric. I focus on the median value of 14 years-rank correlations and how many different signs exist in 14 rank correlations. As we only use S&P 500 firms, in each group, there are around 90 observations. Few observations could lead to a high standard deviation so that to some extent, the correlation is volatile. The cutoff rule[1] here is that for 14 estimations, more than two correlations with different signs or absolute value of average rank correlation small than 0.1[2] are supposed to be to week and unacceptable to achieve the conclusion that two variables can explain each other.

The first issue centres on the effect of two sales growth measures, SG and BTM, on forward EP. Positive correlations are expected. To conveniently compared with BTM, the inverse of forward sales growth, ISG, is used in later analysis. Next, we consider whether the risk can explain forward EP. As there is no consensus on what risk should be, we use stock volatility, the average of standardized BETA, and standardized idiosyncratic risk, as our risk measure, RISK. Table 2 shows the distribution of bivariate correlations, estimated each year.

The rank correlations between two growth measures, ISG and BTM, and forward EP are positive and robust in each year. The positive correlations support our *H1* and *H2*. The median value of the rank correlation between ISG and forward EP is remarkable, 0.32. It shows the importance of forward sales growth in explaining forward EP as forward sales growth shows the presence of

[1] This cut-off rule here is hard to avoid being subjective.

[2] When the absolute value of a correlation is in the range of 0.0 to 0.1, the correlation is considered negligible because data plots project pure scatters. The absolute value of correlations in the 0.1 - 0.2 range are on the weak side (a plot is unpersuasive), 0.2 - 0.3 implies a moderate correlation (not too hard to tell that the plot shows a correlation), and, finally, the absolute value of a correlation above 0.3 is strong (the plot shows a distinct correlation).

forward earnings growth, given a fixed profit margin. The median value of the rank correlation between BTM and forward EP is larger, 0.39. The correlations are also higher for a min, Q1, Q3, and max, compared with those for ISG. These higher correlations show that forward sales growth and BTM explain forward EP differently. As lower BTM indicates more conservative accounting, the obvious correlation emphasizes the effect of the accounting concept. Additionally, the positive and robust correlation between BTM and ISG shows that, to some extent, BTM also involves some forward operational business growth.

Table 2. Bi-variate tests

This table shows the distribution of bi-variate rank correlations. The rank correlation is estimated in each year. ISG is inverse of forward sales growth, sales1/sales2. Forward EP equals eps2 divided by stock price. Book-to-market ratio is book value in year t divided by stock price. RISK is the average of standardized BETA and standardized idiosyncratic risk. Beta and idiosyncratic risk – IVOL, both are calculated from capital asset pricing model.

Spearman Correlations (A, B)							
Variable A	**Variable B**	**N**	**Min**	**25th**	**Median**	**75th**	**Max**
ISG	**Forward EP**	**14**	0.15	0.28	0.32	0.35	0.39
BTM	**Forward EP**	**14**	0.26	0.34	0.39	0.42	0.46
BTM	**ISG**	**14**	0.08	0.17	0.22	0.30	0.33
RISK	**Forward EP**	**14**	-0.39	-0.21	-0.08	0.20	0.29
RISK	**ISG**	**14**	-0.43	-0.31	-0.24	-0.20	-0.13
RISK	**BTM**	**14**	-0.15	-0.09	0.01	0.10	0.20

To deeply understand how these two growth measures affect each other in explaining forward EP, we estimate the effect of one growth measure on forward EP conditional on the other growth measure. Panel A and B in Table 3 show the bi-variate estimations.

The distribution of rank correlations between forward EP and ISG in different levels of BTM is shown in Panel A. In the bottom 20% of BTM, the median of rank correlation is 0.44, which is higher than 0.32 for the full sample. It confirms our assumption that forward EP becomes particularly sensitive to sales growth if the BTM is low. The higher explanatory power of forward

sales growth is quite robust because the unabated table also shows that except for one year, in the other 13 years, rank correlations all are higher than those for the full sample.

In Panel B, we show the distribution of rank correlations between forward EP and BTM in different forward sales growth. As ISG is inverse of forward sales growth, firms in the lower ISG group shows higher forward sales growth. If we focus on the lowest ISG group, the highest forward sales group, we can see the median value of rank correlations is 0.41, higher than that from the full sample, –0.39. Rank correlations in this group all are positive and robust each year. The evidence supports that when forward sales growth is higher, forward EP is more sensitive to BTM.

Combining the facts that forward sales growth - forward EP correlation is stronger when BTM is lower and that BTM – forward EP correlation is stronger when forward sales growth is higher, operational expansion and conservative accounting are mutually supportive.

Next, we consider one special case under which growth is irrelevant. It is that the forward EP and forward sales growth do not correlate if BTM approximates to 1 (or more) as previously documented in H4, because mark-to-market accounting destroys any benefits of positive NPV project, This argument is tested in Panel A of Table 2. In the highest BTM group, the median value of rank correlations between forward EP and ISG is quite weak, 0.09. In four out of 14 years, the rank correlations all are negative. So, we can conclude that ISG cannot explain forward EP. Additionally, from the lowest BTM group to the highest BTM group, the median value of correlations monotonically decreases except in group 4. This decrease articulates that the less conservative the accounting is, the less explanatory power forward sales growth has. Similarly, the number of negative correlations also monotonically increases from 0 to 4. This increase in negative correlations shows the forward sales growth declines its explanatory power with the application of

less conservative accounting. All the above observations support the importance of accounting conservatism in explaining forward EP.

To summarize this section, three conclusions stand out. First, forward sales growth and book-to-market ratio both can practically explain forward EP. Second, forward EP is more sensitive to forward sales growth when BTM is higher. Similarly, forward EP is more sensitive to BTM when forward sales growth is higher. Third, when BTM approximates 1 (or more), forward EP and forward sales growth do not correlate. When the E/P ratio is high, the sales growth and BTM do not correlate. To provide more robust evidence, we do regression analysis by using TS in the next section.

Table 3. Bi-variate tests in different groups

This table shows the distribution of bi-variate rank correlations in different groups. The rank correlation is estimated in each year and group. ISG is inverse of forward sales growth, sales1/sales2. Forward EP equals eps2 divided by stock price. Book-to-market ratio is book value in year t divided by stock price. The last column shows the number of negative correlations versus the number of positive correlations.

Panel A: Spearman Corr. (Forward EP, ISG)							
BTM group	**N**	**Min**	**25th**	**Median**	**75th**	**Max**	**Neg. Corr. vs Pos. Corr.**
Lowest	**14**	0.12	0.41	0.44	0.50	0.61	0 vs 14
2	**14**	0.16	0.28	0.37	0.46	0.53	0 vs 14
3	**14**	-0.03	0.06	0.14	0.26	0.31	2 vs 12
4	**14**	-0.14	0.05	0.08	0.24	0.39	3 vs 11
Highest	**14**	-0.07	-0.02	0.09	0.20	0.37	4 vs 10

Panel B: Spearman Corr. (Forward EP, BTM)							
ISG group	**N**	**Min**	**25th**	**Median**	**75th**	**Max**	**Neg. Corr. vs Pos. Corr.**
Lowest	**14**	0.16	0.31	0.41	0.49	0.57	0 vs 14
2	**14**	0.11	0.31	0.37	0.45	0.55	0 vs 14
3	**14**	0.13	0.22	0.32	0.45	0.59	0 vs 14
4	**14**	0.19	0.24	0.34	0.41	0.50	0 vs 14
Highest	**14**	0.05	0.14	0.20	0.38	0.48	0 vs 14

Panel C: Spearman Corr. (BTM, ISG)							
Forward EP group	**N**	**Min**	**25th**	**Median**	**75th**	**Max**	**Neg. Corr. vs Pos. Corr.**
Lowest	**14**	-0.04	0.06	0.19	0.32	0.41	2 vs 12
2	**14**	-0.04	0.03	0.11	0.20	0.34	1 vs 13
3	**14**	-0.04	0.03	0.12	0.21	0.43	2 vs 12
4	**14**	-0.07	0.05	0.14	0.19	0.32	2 vs 12
Highest	**14**	-0.06	-0.02	0.10	0.18	0.45	4 vs 10

3.3 TS estimations.

This section reports on the regression estimation to supplementary support hypotheses, H1, H2. To avoid the outlier issue, we apply Theil-Sen (TS) estimation rather than OLS. Wilcox (2010) provides a textbook to specifically explicate TS. Ohlson and Kim (2015) discuss the method's efficiency advantages over OLS.

To test the effect of forward sales growth and BTM on forward EP, we estimated the model (1) in each year. Estimated coefficients are shown in table 4.

$$Forward\ EP = \alpha + \beta_1 * ISG + \beta_2 * BTM + \varepsilon \quad (1)$$

Consistent with the hypothesised positive correlation between two growth measures and forward EP, the loaded factors of ISG and BTM, i.e., β_1 and β_2 are positive in all 14 years. The results for both variables are statistically unambiguous.

Table 4. TS: Estimation coefficients from regressing forward EP on ISG and BTM.

This table shows coefficient from the model specification (1). We apply Theil-Sen estimation in each year to avoid outlier issue. ISG is inverse of forward sales growth, sales1/sales2. Forward EP equals eps2 divided by stock price. Book-to-market ratio is book value in year t divided by stock price.

FYEAR	β_1	β_2	Intercept
2001	0.10	0.02	-0.04
2002	0.15	0.02	-0.07
2003	0.07	0.01	-0.01
2004	0.09	0.02	-0.03
2005	0.10	0.03	-0.04
2006	0.08	0.03	-0.02
2007	0.09	0.03	-0.02
2008	0.12	0.03	-0.03
2009	0.17	0.02	-0.09
2010	0.19	0.01	-0.11
2011	0.15	0.02	-0.07
2012	0.17	0.02	-0.09
2013	0.14	0.02	-0.07
2014	0.14	0.02	-0.08

To understand the incremental explanatory power of each growth measure, we estimate rank correlations of model (1) and (2) or (3). The incremental explanatory power of ISG is calculated as the difference of rank correlations between model (1) and model (3). Similarly, the incremental explanatory power of BTM is calculated as the difference of rank correlations between model (1) and model (2).

$$Forward\ EP = \alpha + \beta_1 * ISG + \varepsilon \quad (2)$$

$$Forward\ EP = \alpha + \beta_1 * BTM + \varepsilon \quad (3)$$

The explanatory power of ISG is positive in each year. While the magnitude is quite low. The median value – 0.04, is negligible. Hence, even though the incremental explanatory power of forward sales is statistically significant, the practical incremental effect is barely to see. While, as

the incremental power of ISG is consistent as positive in all 14 years, it casts on the mutually supportive effect.

For book-to-market ratio, the incremental explanatory power is hardly ignored. It is positive in all 14 years and the median value is 0.14. Hence, in addition to forward sales growth, BTM is more helpful in explain forward EP.

Table 5. Incremental explanatory power

This table shows rank correlations between fitted value and dependent variable – forward EP in model (1), (2), and (3) and change in rank correlations. The incremental explanatory power of ISG is estimated as difference of rank correlations between model (1) and model (3). Similarly, the incremental explanatory power of BTM is estimated as difference of rank correlations between model (1) and model (2). ISG is inverse of forward sales growth, sales1/sales2. Forward EP equals eps2 divided by stock price. Book-to-market ratio is book value in year t divided by stock price.

	Spearman Correlation (fitted value and forward EP)			**Incremental Explanatory Power**	
FYEAR	**Model (1)**	**Model (2)**	**Model (3)**	**ISG: (1) – (3)**	**BTM: (1) – (2)**
2001	0.51	0.39	0.42	0.10	0.12
2002	0.45	0.36	0.39	0.06	0.09
2003	0.45	0.30	0.42	0.03	0.15
2004	0.44	0.32	0.41	0.03	0.12
2005	0.49	0.33	0.46	0.02	0.16
2006	0.44	0.20	0.41	0.03	0.24
2007	0.41	0.28	0.38	0.03	0.13
2008	0.40	0.15	0.37	0.03	0.25
2009	0.38	0.33	0.28	0.10	0.05
2010	0.38	0.35	0.26	0.12	0.03
2011	0.38	0.21	0.34	0.04	0.18
2012	0.46	0.32	0.38	0.07	0.14
2013	0.49	0.35	0.45	0.05	0.14
2014	0.44	0.28	0.33	0.11	0.16
Median	0.44	0.32	0.39	0.04	0.14

3.4 Additional finding – the role of risk

Additionally, we consider an obvious potentially omitted variable namely risk. Valuation models, such as Gordon - William model, residual income model, show price decreases with the increase in the discount factor. As the discount factor is positively related to the stock's risk or volatility, forward EP is supposed to be positively correlated with risk. The discussion in textbooks, for example, Ross, Westerfield, and Jaffe (2010), also indicates the risk is related to forward EP. It is said that low-risk stocks are likely to have a lower forward EP ratio. Nevertheless, as higher forward sales growth tends to contain higher risk, and higher forward sales growth decreases forward EP, it seems that high risk negatively correlates with forward EP. Hence, we predict that risk cannot explain forward EP.

As there is no consensus on what risk should be, we use the average of standardized BETA and standardized idiosyncratic risk. Beta and idiosyncratic risk – IVOL, both are calculated from the capital asset pricing model. We examine the correlations between RISK and forward EP. The results are shown in Table 2.

The absolute value of the median rank correlation is smaller than 1, -0.08. Combined with the unstable correlations, spanning from -0.39 to 0.29, risk cannot explain forward EP. The untabulatable empirical evidence using other risk measures, such as beta and idiosyncratic risk has similar results and supports our expectation. Similarly, due to the volatile correlations between RISK and BTM, ranging from -0.15 to 0.20, RISK does not correlate with BTM. As ISG and RISK are negative and robust correlated, it confirms that higher forward sales growth is risky. In conclusion, there is no evidence to show that risk can explain forward EP.

4. Summary Remarks

The findings in this paper explicate how growth explain forward EP and emphasis on the effect of accounting conservatism. Even though it has been documented for a long time that Forward EP correlates with growth, two issues are not explored. One is what growth is in practical investment. The second is how accounting conservatism affects forward EP. Two growth measures, forward sales growth and book-to-market ratio are applied in this study to explain forward EP. Our summary is below.

First, forward sales growth and book-to-market ratio are different even though both are quite common to be used as growth variables. Forward sales growth indicates operational business expansion. While, in addition to operational business expansion, book-to-market ratio casts outcomes of accounting conservatism. When either growth is at a higher level, forward sales growth and book-to-market ratio are mutually supportive in explaining forward EP.

Second, accounting conservatism can affect the effect of growth on forward EP. Conservative accounting leads to the high quality of earnings, and thus lower forward EP. While mark-to-market accounting discounts any benefits of positive NPV project and thus forward sales growth is irrelevant to forward EP. In this regard, this paper reinforces the basic aspects of accounting conservatism.

Reference

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

Feltham, G. A., and Ohlson, J. A. (1996). Uncertainty resolution and the theory of depreciation measurement. *Journal of accounting research*, *34*(2), 209-234.

Harris, R. S., & Marston, F. C. (1994). Value versus growth stocks: book-to-market, growth, and beta. *Financial Analysts Journal*, *50*(5), 18-24.

Johannesson, E., and Ohlson, J. A. 2020. Working Paper. Explaining returns through valuation. Columbia University and The Hong Kong Polytechnic University.

Liu, J., Nissim, D., and Thomas, J. (2002). Equity valuation using multiples. *Journal of Accounting Research*, *40*(1), 135-172.

Ohlson, J. A., and S. Kim. 2015. Linear valuation without OLS: the Theil-Sen estimation approach. *Review of Accounting Studies, 20* (1): 395-435.

Ohlson, J. A. (1995). Earnings, book values, and dividends in equity valuation. *Contemporary accounting research*, *11*(2), 661-687.

Ohlson, J. 2017. Valuation and growth. Working paper. The Hong Kong Polytechnic University.

Penman, S. H. (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. H. (2013). Financial statement analysis and security valuation. Fifth Edition. McGraw-Hill.

Ross, S. A., Westerfield, R., and Jordan, B. D. (2010). *Fundamentals of corporate finance*. Ninth Edition. Tata McGraw-Hill Education.

Ross, S., Westerfield, R., and Jaffe, J. (2012). *Corporate finance*. Ninth Edition. McGraw-Hill Higher Education.

Sharpe, S. A. (2005). How does the market interpret analysts' long-term growth forecasts? *Journal of Accounting, Auditing and Finance*, *20*(2), 147-166.

Wilcox, R. R. (2010). *Fundamentals of modern statistical methods: Substantially improving power and accuracy* (2nd ed.). New York: Springer.