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Abstract:

This paper investigates statistical significance of earnings stability in the within-company indirect valuation method. We empirically establish superiority of a within-company earnings multiple valuation technique for the relatively most stable companies. Favourable empirical results are robust against different means of operationalization of the stability construct and valuation multiples. Results of this paper indicate that the indirect within-company price-to-earnings valuation yields the most precise and the most accurate value estimates.

Key words: Investment Decision; Company Valuation; Earnings Properties

JEL classification: G110; G120; M410

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1 Introduction

Practitioners and academics agree that the value of an asset is determined by the present value of future payoffs to the owner. Williams (1938) formalizes this view and expresses company value as a function of dividend payments. Building on his work, Gordon & Shapiro (1956) derive the Gordon Growth Model for capital budgeting that in its later adjusted forms, Discounted Cash Flow Model or Abnormal Earnings Valuation Model (Ohlson, 1995), dominates the valuation theory to date.

While finance practitioners focus on cash flow figures (Van Aswegen & Jedlin, 2013), academic literature provides empirical evidence that earnings are superior basis for valuation comparing to cash flows. Contrary to the perception of cash flow superiority as a basis for valuation, Dechow (1994) provides empirical evidence that the accrual adjustments made to the cash flow figures remedy their timing and matching problems. In line with the findings of Dechow (1994), Kim & Ritter (1999) and Liu et al. (2002) support the earnings superiority as a basis for valuation with empirical results. Furthermore, Penman & Sougiannis (1998) and Francis et al. (2000) evaluate empirically the consequences of timing and matching insufficiency of cash flows in terms of valuation practice and find the abnormal earnings valuation model, also referred to as the residual income model, to clearly dominate traditional DCF method of valuation.

The indirect, multiple, valuation method is among practitioners the most popular and most often utilized one. Asquith et al. (2005) find a strong preference of indirect to direct valuation techniques by studying 1,126 analyst reports. They find that 99% of sell-side analysts use indirect multiple valuation methods.

We argue that stability is an important characteristic for multiple valuation which has the potential to capture many idiosyncrasies and develop this argument from the residual income model.[1] We provide evidence in favour of this argument by demonstrating superior out of sample prediction for the most stable companies. We document that earnings stability positively influences the accuracy and precision of indirect within-company valuation. We operationalize the stability concept as a 5-year rolling standard deviation of the inverse hyperbolic sine of earnings before extraordinary items attributable to common equity. Hence, We diverge from the commonly found definition of stable company.[2]

Hypothesis development

Exploiting earnings stability of some companies and the superiority of the residual income formula over other direct valuation models (Penman & Sougiannis, 1998), We derive an argument of stable price-to-earnings (PE) multiple for stable companies by expressing the market value using the residual income valuation model, Formula 1, as a sum of the book value of equity at the date of valuation (in practice this is essentially the book value of equity at the year's beginning) and the present value of future residual income.

$$MV_t = BV_0 + \sum_{t=1}^{\infty} \frac{E_t - BV_{t-1} * r_t}{(1+r_t)^t}. \quad (1)$$

[1] We exploit the superiority of the Residual Income Valuation formula, provided by Penman & Sougiannis (1998) and Francis et al. (2000), over other valuation techniques.
[2] Literature refers to a company in a stable state if the company earns return on its equity capital equalling the cost of its equity capital (Stauffer, 1971).

Then, we apply assumptions of stable earnings and stable cost of equity capital.[3] This allows us to utilize the perpetuity valuation principle. Consequently, we derive the argument of PE multiple stability. We claim that for stable companies this multiple equals the inverse value of the cost of equity capital. This procedure is depicted by formulae (2) and (3):

$$MV_t = BV_0 + \frac{E}{r} - \frac{BV_0 * r}{r}, \qquad (2)$$

$$MV_t = \frac{E}{r} \quad \rightarrow \quad \frac{MV_t}{E} = r^{-1}. \qquad (3)$$

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[3] Archer & Faerber (1966) show empirically a negative correlation between the cost of equity capital of the company and its size, its leverage, its age and variation of its earnings. Lev (1983) finds leverage and size of the company as two of a few factors causing earnings stability. Building on the empirical evidence of subsample of stable companies with low cost of equity, We assume that variation of the cost of equity capital of these companies closely approximates stability.

2 Data

The empirical analysis is conducted on the whole universe of publicly traded companies accessible via Thomson Reuters WORLDSCOPE® and DATASTREAM®. In order for the company-year observation to be included in the dataset the following data must be accessible. (1) EPS or earnings before extraordinary items attributable to common equity, (2) book value of equity, (3) number of shares outstanding, (4) fiscal year end date, (5) closing share price at the end of the 4^{th} month after the fiscal year end. The dataset contains 68,589 unique companies during the time-frame spanning from 1980 to 2015, which yields overall number of 862,050 unique company-year observations.

Outlier Treatment

To alleviate the effect of distressed and bankrupt companies we follow the approach adopted by Bhojraj & Lee (2002). We first erase all penny stocks and company-year observations with Net Revenue figure lower than the 1^{st} percentile of Net Revenue in the given country-year. [4] Next, we sort observations with positive aggregate earnings before extraordinary items by the EPS figure and on an annual basis erase the observations with values higher than 98^{th} or lower than 2^{nd} EPS percentile to tackle the effect of economically nonsensical pricing multiples. After constructing the actual Price to Earnings ratio we drop the company-year observations with PE ratios

[4] Bhojraj & Lee (2002) follow nominal specification of the criterion (Sales < 100 MIO USD), however, with respect to international character of this study and the fact that accounting numbers are in local currencies we erase companies at year T if they belong to the bottom percentile of sales figure constructed on a country basis at year T-1.

lower than 5th and higher than 95th PE ratio percentile on an annual basis. This approach tackles the negative effect of the ratio's numerator. [5]

We calculate a 5-year rolling standard deviation of closing share price 4 months after the fiscal year end, then, we drop the companies for which this rolling standard deviation equals 0 to mitigate the effect of listed but not actively traded companies.

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[5] While the mean PE ratio of the top 5 deleted percentile groups across all years equals 7,917.2 and median 2,087.6, the values for the bottom 5 percentile groups are 2.41 and 2.37, respectively.

3 Methodology

Stability Measure Construction

We define the concept of earnings stability using earnings properties. Our concept of stable earnings aims to embrace company-observations with low variation of earnings stream over time.

First, we use the earnings before extraordinary items attributable to common equity in an undeflated form for the base-case operationalization of the construct. Second, we normalize the selected measure for all company-years from the dataset by applying the inverse hyperbolic sine transformation method, as shown by formula (4) which enables us to transform also company-year observations with losses. Next, we opt for the standard deviation of the inverse hyperbolic sine of earnings before extraordinary items attributable to common equity (4) over a 5 consecutive-year window to represent our stability measure.

$$Earn_{IHS} = ln(Earn + \sqrt{(Earn^2 + 1)}) \qquad (4)$$

Finally, we create 10 stability decile groups based on the stability measure in every year to measure relative stability of companies. For this purpose, we sort the companies at year T based on the value of the 5-year rolling standard deviation of the inverse hyperbolic sine of earnings. Subsequently, we create 10 stability decile groups in every year. The decile group number 1 encompasses the most stable companies, while the decile group number 10 the least stable companies.

Statistical Analysis

We carry out the following regression (5) for company-year observations from *final sample* and *subsample of peer companies*[6] conditional on the stability decile groups.

We test a general linear hypothesis that for the individual stability decile groups $\beta = 1$. Potentially favourable results of the general linear hypothesis lay ground for alternative expression of the equation (5). If the earnings coefficient equals 1 for stable companies, one can easily derive an argument for a Price to Earnings ratio stability as presented by equation (6).

$$ln(MarketValue) = \alpha + \beta \times ln(Earnings) + \varepsilon \quad (5)$$

$$E\left[ln\left(\frac{MarketValue_{it}}{Earnings_{it}}\right)\right] = \alpha_i \quad (6)$$

By using company-fixed effects regressions we attempt to capture "time demeaned" within-company information about the time series effect of Earnings on Market Value. In the case of favourable regression results,[7] we can argue that Market Value change proportionally to Earnings of the valued company.

Valuation Analysis

In this paper we opt for valuation analysis approach to evaluate the valuation accuracy and precision of multiple based valuation techniques (Penman & Sougiannis, 1998). We calculate the valuation error and its dispersion for the

[6] We include a company-year observation into a "subsample of peer companies" if the company year observation is from the same *year, country, industry* and *stability decile*

[7] This approach is focused on the time-series within-company relation between earnings and market value. As favourable we consider outcome where the general linear hypothesis that earnings coefficient equals one is met.

within-company valuation method individually for every stability decile group, using solely the information about the valued company.

We test the hypothesis of a higher valuation accuracy and precision of the within-company multiple valuation for companies based on their relative earnings stability. We estimate the price of a company (*i*) four months after the fiscal year end (*t*) by multiplying the last reported earnings (earnings for the fiscal year *T*) by the last year's firm specific Price to Earnings ratio.[8] This ratio is calculated as a closing share price four months after the previous fiscal year end (*t-1*) divided by the arithmetic average of the earnings reported for the fiscal year *T-1* and *T-2*. We opt for the 2-year average earnings in order to marginalize the effect of net income figure fluctuations, since LeClair (1990) argues that this treatment yields the most reliable and the least volatile results comparing to other methods such as declining weights over a longer period or current earnings. Formula (7) expresses the logic of this within-company approach:

$$\widehat{Price}_{i,t} = Earnings_{i,T} \times \left(\frac{Price_{i,t-1}}{\frac{(Earnings_{i,T-1} + Earnings_{i,T-2})}{2}} \right) \quad (7)$$

After obtaining the out of sample value prediction we measure the valuation accuracy of the individual methods. For this purpose, we calculate a valuation error for each value prediction by comparing the predicted value with the realized market value. The magnitude of valuation error represents a measure of valuation accuracy and can be calculated in different forms. We calculate the valuation error as an Absolute Valuation Error expressed as a difference between the predicted and observed market value deflated by the

[8] We impose an assumption that during the four-month period all companies manage to report their annual results. At the same time, this treatment assumes that at the date of market value measurement the price effectively reflects fundaments.

observed market value, Absolute Logarithmic Valuation Error as absolute difference between the logarithm of the predicted and observed market value, and Squared Valuation Error as a squared value of the difference between the predicted and observed market value deflated by observed market value. These measures are calculated as stated in the description of Table 2.

After evaluating the valuation accuracy, we describe the distributional characteristics of the valuation error in order to evaluate the valuation precision. We evaluate the distributional characteristics, hence valuation precision, by observing the interdecile and interquartile ranges of the absolute valuation error.[9] We calculate the interdecile range as the difference between the value of the 90th and 10th percentile of the Absolute Valuation Error. The interquartile range represents the difference between the value of the 75th and 25th percentile of the Absolute Valuation Error.

[9] We use the standard deviation as a complementary statistic, but we argue that it is prone to be sensitive, hence exposed to the effect of extreme values.

4 Results

Table 1 presents the results of the company fixed effects panel regressions with company clustered standard errors conditional on the earnings stability decile group. Panel A of the Table 1 provides results for the whole sample, while Panel B presents results for the subsample of peer companies.

Throughout the whole sample the earnings coefficient decreases gradually as company stability decreases.[10] While a 1% increase in Earnings for the average company in the 1st stability decile group results in a 0.8% increase in Market Value, this increase is only 0.66% in the 5th and 0.19% in the 10th decile group. Moreover, the general linear hypothesis of the earnings coefficient being equal to one is rejected in all cases since none of the earnings coefficient intervals constructed on the 95% confidence level contain 1.000.

Assessing the results for the subsample of peer companies, presented in the Panel B of the Table 1, we find that the tenor of the results changes slightly. While the decreasing determination of Market Value by Earnings figure resulting from the decreasing stability remains, we cannot reject the general linear hypothesis of the earnings coefficient being equal to one for the most stable decile group. Therefore, we claim that in the case of the most stable decile group, on average, the Market Value of a company is over time fully proportional to Earnings of a company.

[10] Except for the 2nd stability decile group for which the coefficient is even slightly higher than for the most stable decile group. We argue that this is possible an effect of insufficient outlier treatment.

Table 2 provides results of the within-company PE valuation for the final sample (Panel A) and the subsample of peer companies (Panel B). Based on these results we can state the following findings. First, relative earnings stability apparently affects the valuation accuracy and precision of the within company valuation. This effect is documented by increasing absolute valuation error and interquartile and interdecile range with decreasing company stability. Second, conducting the analysis on the companies belonging to a 5-member peer group decreases the absolute and squared valuation errors as well as interquartile and interdecile ranges of these measures even further and in a more systematic manner. Moreover, it stabilizes the trend of the remaining valuation error measures.

5 Conclusion

We argue that the Market Value of stable companies moves proportionally to Earnings. We tested the argument of Market Value and Earnings proportionality empirically by conducting valuation analysis to find that the PE multiple valuation technique[11] provides the most accurate and the most precise value estimate for the relatively most stable companies. These results are robust against numerous methods of stability construct operationalization.

To synthesize, we find that if one is conducting an indirect valuation, on an exceptionally stable and publicly traded company, one should use its last year's PE ratio and multiply it by current earnings figure in order to obtain the superior value estimate. We conclude that in the case of the most stable companies the accounting earnings approximate Black's (1980) concept of economic earnings exceptionally well.

A naturally appealing extension of this study will be to examine empirically the effect of the earnings stability as a peer selection criterion for the between-company peer selection method. Furthermore, research of an active trading strategy in which one would buy stocks marked by this method as undervalued, sell stocks marked as overvalued might yield interesting results. Finally, empirical analysis of the effect of earnings stability on the outcome of privately held company transactions should be addressed.

[11] Results for Price to Sales and Price to Free Cash Flows techniques are untabulated but their tenor remains.

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Tab. 1

Regression Coefficient by Earnings Stability Decile - Company Fixed Effects

This table shows the results of the panel regression of ln(Market Value) on ln(Earnings) using company-fixed effects and company clustered standard errors. Panel A represents the results of the regression applied on a full sample of 284,390 company-years divided into 10 earnings stability deciles based on a 5-year rolling standard deviation of the inverse hyperbolic sine of Earnings. Panel B represents the results for the subsample of Peer Companies. We define a peer-company as one being drawn from the subsample of companies from the same *year, country, industry* and *earnings stability quantile*. In orded to include the company into analysis its peer-group has to constitute of at least 5 companies.

$$\ln\left(\text{MarketValue}_{i,t}\right) = \alpha + \beta \times \ln\left(\text{Earnings}_{i,T}\right) + \varepsilon$$

We construct the confidence intervals of the regression coefficients using 95% confidence level. If the confidence interval includes 1.000 We cannot reject the general linear hypothesis of Beta coefficient being differenct from 1.000

Panel A. Full Sample

	Stability Decile									
	1	2	3	4	5	6	7	8	9	10
lnEARN	0.801***	0.812***	0.777***	0.720***	0.664***	0.560***	0.470***	0.362***	0.265***	0.199***
	(0.770 - 0.832)	(0.790 - 0.834)	(0.758 - 0.796)	(0.702 - 0.738)	(0.643 - 0.684)	(0.541 - 0.579)	(0.452 - 0.489)	(0.343 - 0.381)	(0.252 - 0.279)	(0.184 - 0.213)
Constant	5.226***	5.129***	5.562***	6.246***	6.916***	8.107***	9.121***	10.314***	11.326***	11.956***
	(4.873 - 5.579)	(4.874 - 5.384)	(5.336 - 5.787)	(6.035 - 6.457)	(6.682 - 7.149)	(7.887 - 8.326)	(8.913 - 9.329)	(10.104 - 10.524)	(11.178 - 11.474)	(11.798 - 12.114)
N	28,226	31,903	31,846	31,326	30,404	29,388	27,955	25,910	23,482	18,076

Panel B. Subsample of Peer Companies

	Stability Decile									
	1	2	3	4	5	6	7	8	9	10
lnEARN	1.012***	0.898***	0.856***	0.825***	0.754***	0.644***	0.441***	0.338***	0.359***	0.225***
	(0.947 - 1.077)	(0.839 - 0.957)	(0.803 - 0.909)	(0.766 - 0.884)	(0.668 - 0.839)	(0.564 - 0.723)	(0.371 - 0.510)	(0.273 - 0.403)	(0.257 - 0.461)	(0.153 - 0.296)
Constant	2.675***	3.893***	4.369***	4.700***	5.559***	6.836***	9.060***	10.175***	9.842***	11.405***
	(2.012 - 3.338)	(3.276 - 4.511)	(3.804 - 4.933)	(4.064 - 5.336)	(4.631 - 6.487)	(5.975 - 7.697)	(8.312 - 9.809)	(9.482 - 10.868)	(8.779 - 10.905)	(10.657 - 12.152)
N	3,788	3,677	3,245	2,847	2,420	2,162	1,863	1,585	1,243	937

* $p<0.05$; **$p<0.01$; ***$p<0.001$

Source: Own Calculations

Tab. 2

Firm-Specific PE Valuation Error Analysis

This table shows the results for the Within-Company valuation technique. We estimate the Market Value (hereby "MV") of a company 4 months after its fiscal year end as a result of multiplying the last year's Price to Earnings ratio of the given company by its last announced earnings. We calculate the absolute, squared and absolute log valuation error as follows:

$$e_{i,t} = \frac{\left|\overline{MV}_{i,t} - MV_{i,t}\right|}{MV_{i,t}} \qquad e_{i,t} = \left(\frac{\overline{MV}_{i,t} - MV_{i,t}}{MV_{i,t}}\right)^2 \qquad e_{i,t} = \left|\log\left(\overline{MV}_{i,t}\right) - \log\left(MV_{i,t}\right)\right|$$

We construct the Interquartile Range as value of the 75th percentile less value of the 25th percentile and Interdecile Range as a value of the 90th percentile less value of the 10th percentile of Absolute and Squared Valuation Error

Panel A contains results of the valuation analysis conducted on the *Final Sample*, Panel B contains results for the *Subsample of Peer Companies*.

Panel A. Full Sample

Earnings Stability Decile	#Companies	Mean Absolute Error	Mean Squared Error	Mean Absolute Log Error	Absolute Valuation Error		Squared Valuation Error	
					Interquartile Range	Interdecile Range	Interquartile Range	Interdecile Range
1	27,743	0.250	1.082	0.234	0.260	0.524	0.092	0.244
2	30,746	0.298	1.031	0.276	0.314	0.624	0.128	0.328
3	30,532	0.347	0.875	0.319	0.368	0.748	0.176	0.438
4	29,976	0.399	0.805	0.367	0.437	0.916	0.239	0.600
5	29,199	0.474	1.645	0.424	0.490	1.136	0.311	0.849
6	28,361	0.564	2.514	0.497	0.561	1.394	0.418	1.224
7	26,848	0.674	1.514	0.591	0.648	1.800	0.539	1.888
8	25,067	0.857	3.204	0.729	0.795	2.322	0.690	3.205
9	22,752	1.120	5.216	0.916	1.051	3.077	0.881	5.842
10	17,683	1.524	13.124	1.154	1.330	4.284	1.406	10.647
Total	268,907	0.574	2.391	0.495	0.552	1.300	0.383	1.106

Panel B. Subsample of Peer Companies

Earnings Stability Decile	#Companies	Mean Absolute Error	Mean Squared Error	Mean Absolute Log Error	Absolute Valuation Error		Squared Valuation Error	
					Interquartile Range	Interdecile Range	Interquartile Range	Interdecile Range
1	3,788	0.194	0.076	0.192	0.193	0.385	0.062	0.168
2	3,677	0.254	0.137	0.245	0.252	0.479	0.109	0.265
3	3,245	0.311	0.188	0.298	0.308	0.579	0.162	0.387
4	2,847	0.369	0.294	0.351	0.366	0.704	0.229	0.566
5	2,420	0.447	0.481	0.405	0.429	0.855	0.310	0.830
6	2,162	0.526	0.618	0.476	0.485	0.973	0.415	1.095
7	1,863	0.647	1.027	0.558	0.557	1.286	0.530	1.859
8	1,585	0.809	1.700	0.688	0.648	1.705	0.727	3.206
9	1,243	1.044	4.942	0.816	0.694	2.157	0.848	5.064
10	937	1.658	18.514	1.038	0.954	3.250	1.471	11.261
Total	23,767	0.472	1.250	0.410	0.422	0.866	0.280	0.831

Source: Own calculations