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Earnings Stability and Peer Company Selection for Multiple Based Indirect Valuation*

Karel JANDA - Department of Banking and Insurance, Faculty of Finance and Accounting, University of Economics, Prague; Institute of Economic Studies, Faculty of Social Sciences, Charles University, Prague (Karel-Janda@seznam.cz)

Abstract

We contribute to the development of indirect valuation method for publicly traded companies. We introduce relative earning stability as a new dimension of peer selection criteria for determination of appropriate comparable group of peer companies to the evaluated company. Based on large sample of all publicly traded companies in Thomson Reuters database over recent 35 years, we provide empirical evidence of significant improvement of indirect valuation accuracy and precision as a result of our relative earning stability approach. Peer selection based on the relative earnings stability takes account of some idiosyncrasies of companies, which remain uncaptured by traditional industrial classification based peer selection methods. We also empirically establish superiority of a within-company price to earnings (PE) valuation technique for the most stable companies. Our empirical results are robust against different means of operationalization of the stability criterion and indirect valuation methods.

1. Introduction

In this article we present an improved peer selection method for the choice of comparable companies used in the indirect method of company valuation. We introduce the concept of relative earning stability as a criterion for the selection of peer group with respect to which the company is evaluated. We empirically evaluate this earning stability concept and we confirm an increase in valuation accuracy and precision with respect to benchmark method based on time/space/industry approach to the selection of comparable group of companies. In the context of this analysis we also contribute to the discussion on performance of Price to Earnings ratio as compared to Price to Book Value ratio.

The valuation of company is a cornerstone of both corporate finance (Vernimmen et al, 2018) and mergers and acquisitions (Sherman, 2018) theory and practice. Commonly used valuation methods may be classified into four categories according to two classification dimensions (Ferris and Petitt, 2013). The first

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dimension separates models based on direct (or absolute) and indirect (or relative) valuation methods. Since valuing a company using an indirect valuation method requires identifying a group of comparable companies, this approach is also called the comparables valuation method. The second dimension distinguishes between cash flow models and models using different financial variables for valuation. Our article focuses on indirect valuation model using non-cash flow variables (Price to Earnings and Price to Book Value ratio).

Indirect (relative) valuation is based on the use of multiples, which are simply ratios between two financial variables. The numerator of the multiple is usually either the company's market price (in the case of price multiples) or its enterprise value (in the case of enterprise value multiples). The denominator of the multiple is an accounting metric, such as the company's earnings, sales, or book value. Multiples can be calculated from per-share amounts (market price per share, earnings per share, sales per share, or book value per share) or total amounts. The choice to use per-share amounts or total amounts does not affect the multiple, as long as the same basis is used in both the numerator and the denominator. In this article we use two price multiples: Price to Earnings and Price to Book Value. The value of the company is subsequently easily determined by multiplying its expected or actual Earnings or Book Value (or any other accounting variable for different multiples) with an appropriate multiple.

The indirect valuation method is the most popular and most often utilized corporate valuation method used by practitioners both globally (see discussion of results by Asquith et al. (2005), Bancel and Mittoo (2014), and Pinto et al. (2015)) and in the Czech Republic (Vydrzel and Soukupova, 2012). While its popularity is a result of its many advantages, such as convenience and comprehensiveness, it also features drawbacks potentially harmful to practitioners. These are mainly peer selection process and a potential of industry mispricing which could both significantly distort the valuation results. While there is no shortcut to dampen the threat of industry mispricing and practitioners should conduct direct valuation in order to be guarded against serious value misestimate, we claim that there is a company characteristic that can significantly improve the peer selection process. During the peer selection process, practitioners tend to pick peer companies from within the same industry. They believe that the industry median multiples encompass most of the industry specifics towards which all companies from the industry tend to revert. Consequently, it is assumed, that industry specification captures some if not most of the idiosyncrasies of the valued company, since these are believed to be shared between companies from the same industry. Therefore, the industry median multiple should, in theory, explain the variation of the given multiple exceptionally well. We argue that the effect of relative earnings stability provides additional information about the variation of valuation multiples. In this research paper we provide empirical evidence of significant improvement of out of sample valuation accuracy and precision for the Price to Earnings, (PE), and Price to Book Value (PBV), multiple valuation technique by introducing relative earnings stability as a peer selection criterion. While a corporate finance literature devoted a substantial effort to comparison of different valuation techniques, discovery of best practices in applying multiples for valuation purposes (Bancel and Mittoo, 2014; Plenborg and Pimental, 2016), and peer selection (Knudsen et al., 2017), the effect of relative earning stability on the multiple valuation accuracy

has never been studied before our research project (Kaszas, 2015; Kaszas and Janda, 2018; and a current article).

We argue that stability is an important characteristic of peer groups in multiple valuation and develop this argument from the residual income model. We provide evidence in favour of our argument by using large sample based on the whole population of all publicly traded equity securities of companies from all countries covered by Thomson Reuters WORLDSCOPE® database from 1980 to 2015. We demonstrate superior out of sample prediction for the most stable companies. We document that earnings stability (1) positively influences the accuracy and precision of multiple valuation for both, within and between companies and that (2) the inclusion of company stability into peer selection criteria provides significant enhancement in terms of decreasing the mean, median and dispersion of the absolute valuation error compared to a standard (Alford, 1992) method, hence increasing the valuation accuracy and precision.

As opposed to usual approach to evaluation of company stability based on Stauffer (1971), we define stable company by its earnings properties. While previous finance literature considers a company to be in stable state if its return on its equity capital equals the cost of its equity capital, our innovative characterization of stable company is based on the time variation of its earnings stream. We construct our new stability measure as a 5-year rolling standard deviation of the inverse hyperbolic sine of earnings before extraordinary items attributable to common equity.

We observe that P/E valuation method based on country and industry membership, is significantly outperformed in terms of its accuracy and precision throughout the whole sample when the relative earnings stability property, measured by a 5-year rolling standard deviation of the inverse hyperbolic sine of earnings, is taken into account during the peer group creation. We reach this conclusion by comparing the price deflated absolute valuation error, absolute logarithmic valuation error and dispersion of these errors. These metrics provide evidence on domination of our peer selection method over the method currently referred to as the best practice (Alford, 1992).

Finally, we perform numerous robustness checks and find that our results are generally robust against all performed changes in the valuation procedure. For the purpose of robustness check we construct the stability measure in a deflated form, using Earnings per Share, Return on Equity and Return on Sales, and based on Cash Flow from Operations. We broaden the rolling window of each stability measure from five to seven years. We use a two-year average instead of last year's earnings to estimate the out-of-sample market value.

The remainder of this research paper is structured as follows. In the second section we review the relevant finance and accounting literature. We develop the argument that peer group selection based on stability improves valuation accuracy in the third section. The fourth section focuses on the data collection, stability measure creation and data manipulation. In the fifth and sixth section we provide detailed description of our methodology and results. This description is followed by a conclusion, and discussion of limitations and further research suggestions.

2. Literature Review

The key issue of corporate finance literature is the valuation of a company in order to determine the value of its shares or of its equity capital. Financial theory generally accepts that valuing a firm is not a straightforward process and that any valuation model naturally leads to an imprecise answer, forcing analysts to use more than one valuation method. According to a survey of European experts (Bancel and Mittoo, 2014), only about 20% practitioners use a single firm valuation method, while about 60% of respondents rely on two or three methods with the rest of respondents using even more methods.

As a basic fundamental principle both practitioners and academics agree that the value of an asset is determined by the present value of the 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.

These models belong to direct valuation methods that derive the "true" corporate value using three pieces of information unique to the company - value driver such as dividends, earnings or cash flows, its growth and an appropriate discount rate. While these valuation models share the same theoretical background, thus should be perfect substitutes in theory, they have a substantially different notion on the valuation process.[1] From these direct methods, finance practitioners often prefer cash flow based methods (Van Aswegen & Jedlin, 2013). Out of two most popular variants of Discounted Cash Flow Model, which are Free Cash Flow to the Firm (FCFF) and Free Cash Flow to Equity (FCFE), almost 80% of European experts use FCFF and less than 40% use FCFE (Bancel and Mittoo, 2014).

While finance practitioners fixate on cash flow figures, 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, in order to obtain earnings figures, remedy the timing and matching problems of cash flows. In line with the findings of Dechow (1994), Kim & Ritter (1999) and Liu et al. (2002) argue with empirical results of earnings superiority as a basis for valuation.

From contemporary knowledge one can confidently claim that amongst the direct valuation models, empirical results suggest clear domination of abnormal earnings valuation model. Penman & Sougiannis (1998) evaluate empirically the consequences of timing and matching insufficiency of cash flows in terms of valuation practice. They find that while all direct valuation models result in the same value predictions for infinite time intervals, the accuracy of value predictions differ significantly if the valuation is done for limited forecasted period of a few years. Conducting a large scale study Penman & Sougiannis (1998) argue in favour of the thesis that accrual adjustments to cash flow figure provide enhancement to value relevance. By comparing valuation results of different direct valuation models they

[1] For demonstration of theoretical equality of these valuation models see (Palepu et al., 2013).

conclude the following. First, dividend discounting is inappropriate method of corporate valuation for finite horizons. Second, discounted cash flow models perform sufficiently within the forecasted period, however, it is the calculation of terminal value which significantly distorts the results of this method. Third, abnormal earnings valuation model is the dominant valuation technique in terms of valuation accuracy. The results of another large-scale study carried out by Francis et al. (2000) support these claims. Francis et al. (2000) however, conclude that the superiority of abnormal earnings model is not caused solely by lower proportion of terminal value estimates but rather by a sufficient approximation of intrinsic value by a book value of equity. This close approximation of intrinsic value by book value of equity means that accounting standards make a good job in terms of reflecting the economic reality.

While the direct valuation models covered in the preceding paragraphs provide a direct and financial theory based estimate of a firm's fundamental value, the most popular valuation method among practitioners is the indirect valuation. 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, either solely or in conjunction with direct valuation method, to calculate target price estimates. This is arguably due to simplicity and generally small margin of difference in the accuracy of direct and indirect methods (Dechow et al., 1999). Bancel and Mittoo (2014) in their survey of 365 finance practitioners in Europe show that the relative valuation is the most popular firm valuation method being used by 80% of survey participants (with a majority of them using relative valuation jointly with some other approach). Similarly Pinto et al. (2015) show that 92.8% of the sample of 1980 equity analyst members of the Chartered Financial Analyst (CFA) Institute use the market multiples approach, i.e. indirect valuation. In the case of indirect valuation, the value of a company is obtained by capitalizing a value driver, such as earnings, book value of equity, sales etc., by a multiple observed for a set of peer companies (Arzac, 2004). When conducting indirect valuation, financial analysts rely on a stock market efficiency to set a truthful valuation multiple for peer companies. Certain indirect valuation could also result from a significant cycle of market price of company's share (Stadnik, Raudeliūnienė & Davidavičienė 2016) or from a market price volatility of bond issued by a company (Stadnik 2014). As a result of market efficiency assumption, analysts and investors are not guarded against a potential industry mispricing. This threat of potential industry mispricing means that subjective and prudent choice of peer companies, along with a careful decision when to utilize the indirect valuation method, is crucial for accurate and precise value estimates (Koller et al., 2010).

The valuation literature unanimously emphasizes that identifying appropriate peer companies is a most crucial step in conduction of indirect multiple valuation, since using dissimilar firms can lead to significantly biased valuation estimates (Plenborg and Pimental, 2016). As suggested by the discussion of direct valuation approach at the beginning of this literature survey, truly comparable firms must have similar cash flows streams. However, to select firms with highly similar cash flow would require the analyst to develop the cash flow projections. However this would remove the major advantage of indirect valuation as a way how to avoid detailed computation of discounted cash flow valuation of the valued firm. Instead of finding discounted cash flow just for valued firm, the analyst would have to compute discounted cash flow for

this firm and a number of possible peers. Therefore finding a good group of comparable firms involves a trade-off between finding comparable firms and the effort needed to do so.

Generally, there are three main approaches to peer group selection (Plenborg and Pimental, 2016). The first and most influential school of thought argues that peer group selection should be based on industry classification. This approach may be traced back to the study of Boatsman & Baskin (1981), which is one of the first to shed light on a peer selection. In search for the best valuation method in an incomplete information environment they test two different peer selection methods. The selection of a peer company from within the same industry and the closest earnings growth rate over the last 10 years provided more accurate results than random selection of a company from the same industry. However the most influential paper in this industry classification school of thought is Alford (1992). By using valuation analysis and different peer selection methods Alford (1992) concludes that (1) industry classification captures most of the company's characteristics, (2) industry median PE multiple provides the most accurate value estimates comparing to risk, growth and leverage adjusted methods (3) risk, measured by total assets, and earnings growth, measured by Return on Equity (ROE), do not provide marginal accuracy improvement when applied with the industry classification criterion, (4) adjusting the PE ratio for leverage decreases the valuation accuracy. Beaver & Morse (1978) as well conclude, based on a portfolio approach towards PE valuation, that growth has no explanatory value for the PE multiple.

The second school of thoughts argues that the selection of comparable companies should include only companies with similar valuation fundamentals (profitability, growth, risk etc.). The major representative of this approach are Bhojraj & Lee (2002) who develop an estimation model depending on 8 characteristics in order to estimate a "warranted multiple". They show that taking the harmonic mean of Enterprise Value to Sales multiple of 4 companies with the closest warranted multiple to the valued company results in the most accurate and precise valuation results. Contrary to previous studies, Bhojraj & Lee (2002) find that profit margins, earnings growth forecast and risk factors explain a substantial share of the Enterprise Value to Sales multiple variation, even after controlling for industry. However Bhojraj & Lee (2002) as well acknowledge that the industry specification explains the most of the Enterprise Value to Sales multiple from all the studied factors which provides important reconciliation with the industry classification approach of Alford (1992) and his followers.

The third approach to peer selection is based on analysis of search traffic patterns on websites. Lee et al. (2015) as major proponents of this approach argue that two firms that are frequently co-searched by multiple users on specialized web platforms are fundamentally connected or economically similar. In their research Lee et al. (2015) analysed the search traffic patterns at the Electronic Data-Gathering, Analysis, and Retrieval website provided by the U.S. Securities and Exchange Commission.

In our article we relate to the prevailing industry classification paradigm (schools of thoughts 1 and 2 in our review) and we extend this line of research with respect to adding a company's stability criterion into the peer-group selection process.

In this stability research effort we build up on the literature characterized in the following paragraphs.

Finance literature identifies stable and unstable sub-populations of companies, certain business characteristics resulting in earnings stability and the positive effect of these characteristics on market capitalization of a company. Lamp (2014) carries out a latent class analysis and finds two latent sub-populations, one with stable and one with unstable earnings. He acknowledges that stable companies are prone to be consistently profitable but earn lower returns, on the other hand, unstable companies are characterized, on average, with negative earnings. Stigler (1963) points out the competitive force as a factor leading to economic instability, claiming that the most stable companies are those from concentrated industries with sufficiently high barriers to entry. Zarnowitz (1967) finds significantly higher earnings prediction error for durable than for nondurable products as a result of lower time-series earnings variability for nondurables. Whittington (1971) provides evidence for relative stability of companies with relatively higher market valuation. On the other hand, Lev (1974) points out the instability of highly levered companies. Conclusively, Lev (1983) confirms all of these findings by conducting a comprehensive regression analysis. Lately, Dichev & Tang (2009) argue with empirical results that volatile earnings result in systematically higher prediction errors than stable earnings, they explain this finding by lower earnings persistence of less stable earnings. Such a volatile earnings streams are perceived as relatively risky, thus implying higher risk premia and consequentially lower enterprise values for these companies (Hunt et al., 2000).

To conclude, while only the direct valuation methods derive a "true" value of a company by addressing each and every idiosyncrasy of a valued company, indirect valuation methods are vastly preferred. Amongst the direct methods the Abnormal Earnings Model, also called the Residual Income Model, is apparently the best valuation model with studies providing consensual evidence in favour of this claim (Francis et al., 2000) and (Penman & Sougiannis, 1998). Indirect valuation methods represent extremely popular shortcut valuation techniques (Asquith et al., 2005), which are very convenient and easy to conduct. On the other hand, their accuracy and precision are dependent on the peer selection. Surprisingly, there is no unified peer selection method, perhaps besides the fact that the median industry multiple captures most of the valuation multiple variability, with studies providing conflicting results, (Alford, 1992) and (Bhojraj & Lee, 2002). The literature agrees that the earnings multiple results in the most accurate value estimate comparing to other valuation multiples.[2] The superiority of the PE multiple over other valuation multiples is particularly apparent when one applies the earnings multiple on a forecasted earnings figures, (Liu et al., 2002) and (Kim & Ritter, 1999). This is likely to be a result of accrual adjustments (Dechow, 1994). Finally, the finance literature identifies business characteristics leading to less volatile earnings stream (Lev, 1983), which results in higher earnings persistence (Dichev & Tang, 2009) and consequently to higher enterprise value (Hunt et al., 2000). To our knowledge, the effect of earnings

[2] This claim, however, is conditional on a profitability of a company. For unprofitable companies earnings multiple provides unreasonable, negative, value estimates and therefore it is not used in actual valuation practice.

persistence, hence earnings stability, on the indirect valuation method accuracy and precision has not been studied so far and is addressed in our research for the first time.

The most recent research provides evidence of earnings stability socio-economic impact, long-term returns of unstable companies and relation between stable earnings stream and stable stock ownership. Using within-company variation of earnings and employer-employee data, Strain (2017) finds that earnings volatility negatively affects employee well-being. This effect is surprisingly pronounced the most on the lowest wage earning employees. These results point at important socio-economic impact of corporate earnings. Batabyal & Robinson (2017) argue that earnings stability has significant effect on capital retention ratio and prove thesis of higher earnings retention negatively affecting future returns of unstable companies. Sakaki et al. (2017) shed light on a correlation between stable earnings and stable ownership. Empirical results are provided in favour of a thesis that presence of stable institutional investors tapers potential earnings management activities and earnings-aggressive initiatives, resulting in stable earnings stream.

3. Hypothesis Development

From the view of industry characteristics, Lev (1983) identifies industry and firm-specific factors resulting in stable earnings stream. As he argues, variation of an earnings stream is explained by the "height" of industry entry barriers, product longevity, diversification of the company's product portfolio and its market value. From the earnings properties view, earnings persistence represents the proportional amount of the current earnings explained by the prior earnings figure, this way, one can directly link the earnings persistence with the earnings stability. Dichev & Tang (2009) examine the effect of earnings persistence and claim that higher earnings persistence leads to a lower estimation error.

We derive an argument of stable PE multiple for stable companies in the following fashion. Firstly, we express 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.

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

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):

[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.

$$MV_t = BV_0 + \frac{E}{r} - \frac{BV_0 * r}{r} \tag{2}$$

$$MV_t = \frac{E}{r} \quad \rightarrow \quad \frac{MV_t}{E} = r^{-1} \tag{3}$$

It is important to note, that since this argument is based on the residual income valuation model, it shares the assumption of the clean surplus relation (Felthman & Ohlson, 1995). Furthermore, in order to apply a perpetuity valuation principle on the residual income, we indicate a necessity to assume full earnings distribution in order to stabilize the book value of equity.

While the clean surplus relation is in practice prone to be violated through "Other Comprehensive Income" items, many authors argue by empirical results that residual income model provides the best value estimate compared to other valuation methods (Penman & Sougiannis, 1998). This is due to a relative marginality of OCI items as well as their volatile nature, which is likely to zero-out over longer time period (Francis et al., 2000).

On the other hand, prior to our analysis we cannot provide any empirical evidence to justify the assumption of a dividend policy aimed at retaining stable book value of equity. We can merely rationally argue that companies characterized by earnings stream stability are more likely to introduce any kind of dividend policy than their counterparts characterized by highly volatile earnings stream.[4] This stems from the predictability of operational results, which is likely to impose lower earnings retention requirements (Baumol et al., 1970).

To conclude, multiple valuation has more theoretical support for stable companies than for their less stable counterparts. Exploiting the evidence that direct valuation, using Residual Income valuation model, has superior predictive power we hypothesize that multiple valuation method, in form of Price to Earnings multiple, yields lower valuation error for companies with stable earnings stream. We expect to find lower valuation errors for PE multiple valuation technique in case of stable companies.

A complementary hypothesis regarding the Price-to-Book Value (PBV) ratio is included in the appendix.

4. Data

The dataset used in this study contains the whole universe of publicly traded equity securities of active and inactive (dead and suspended companies for which the dataset contains data up to a termination year) companies from all countries followed by Thomson Reuters WORLDSCOPE® database from 1980 to 2015. Overall, this dataset contains 68,589 unique company identifiers at the date of data collection, which yields 862,050 company-year observations.

[4] Companies for which their return on investments equals their cost of capital should, following economic rationality, pay out any excess earnings to investors if, by law of diminishing returns, incremental investment results in lower returns. This action lowers the ROE denominator and consequently improves ROE.

For these companies, accounting data (Earnings, Sales, Book Value of Equity, Total Assets etc.), industry and market classification (SIC codes and country identifiers), monthly closing prices and fiscal year end dates are accessed via Thomson Reuters DATASTREAM®.

The following data have to be available in order to include the observation in the analysis: Either earnings per share or earnings before extraordinary items attributable to common equity, book value of equity, number of shares outstanding, fiscal year end date, closing share price at the end of the 4th month after the fiscal year end.

4.1 Data Manipulation

Earnings Stability Measure

Following the arguments outlined in the hypothesis development section 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. We introduce 5 year rolling standard deviation of the inverse hyperbolic sine of earnings as our stability measure.

First, earnings before extraordinary items attributable to common equity convey the information about the net economic benefits of the fiscal period for common shareholders, therefore, we use this measure in undeflated form as a base-case variable. 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).

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

Next, we opt for the standard deviation of the inverse hyperbolic sine (4) over a 5 consecutive-year window to represent our stability measure. While the standard deviation should properly evaluate the variation of the underlying measure, the length of the rolling window on which it is calculated introduces a factor of subjectivity. If the length of the rolling window is chosen too short, the actual measure could misaddress the concept of stability as defined above.[5]

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. We calculate the rolling standard deviation at year T on a basis of T-5 to T-1 values of the inverse hyperbolic sine of earnings. Subsequently, we create 10 stability decile groups in every year.[6] The decile group number 1 encompasses the most stable companies, while the decile group number 10 the least stable companies.

[5] To alleviate this concern we conduct a robustness check using 7-year rolling window to calculate stability measure for all its specifications, base case as well as all robustness checks.

[6] In addition, using the same approach, we create 30 and 300 quantile groups in order to use them in supplementary valuation analyses as "finer" relative stability indicators.

Outlier Treatment and Data Filtering

Using the approach adopted by Bhojraj & Lee (2002) we firstly erase all penny stocks, cent-worth shares traded for less than 1 nominal unit of the local currency, and company-year observations with the last year's Net Revenue figure lower than the 1st percentile of Net Revenue in the given year and country. [7] These initial treatments aim to erase observations of distressed and bankrupt companies as well as companies reporting only marginal economic activity.

Next, we sort observations with positive aggregate earnings before extraordinary items by the EPS figure on a yearly basis and erase, in every year, the observations with values higher than 98th or lower than 2nd EPS percentile, since these values are likely to result in economically unjustified PE ratios. For instance, the companies belonging to the lowest 2 percentile groups constructed on a yearly basis based on the EPS figure have a mean PE ratio of 7,133.8 and median of 745.7.

While the previous treatment should address the systematic problem of extreme PE ratio values caused by the inclusion of extremely low numbers in the denominator of the ratio (EPS figure), it may not fully address the issue of the data quality since the misstated earnings values do not have to be extreme on themselves, yet they could result in extreme PE ratios. Therefore, after constructing the actual Price to Earnings ratio we drop the company-year observations with PE ratios lower than 5th and higher than 95th PE ratio percentile every year.[8] Although this procedure erases 10 % of observations every year, it significantly approximates the actual PE values in the dataset to economic reality and helps to marginalize the effect of outliers and eventual misstatements. We proceed identically with the Price to Book Value ratio.

The dataset contains also publicly listed companies that are operational and report their accounting results but their shares are not traded actively what results in stable price of their shares. This share price, however, is not economically justified and is merely a result of a lack of trading activity. To prevent an undesired effect of such companies on the valuation analysis results we do the following. 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.

Furthermore, as we describe in the methodology section, we calculate Price to Earnings and Price to Book Value ratios used in the valuation analysis on a basis of 2-year average figures in order to marginalize the effect of income statement and balance sheet numbers fluctuation. We filter out the company-year observations for which both of the ratios are not available.

[7] 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.

[8] 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.

Table 1 Number of Companies by Year & The Effect of a Data Manipulation

Year	*Full Sample*	*After Duplicates*	*Stability Measure*	*Final Sample*	*Subsample of Peers*
1980	7,478	3,596	0	0	0
1981	7,724	3,730	0	0	0
1982	7,985	3,891	0	0	0
1983	8,692	4,351	0	0	0
1984	9,242	4,653	3,469	1,725	113
1985	10,803	5,717	4,064	1,947	124
1986	11,897	6,402	4,572	2,294	182
1987	14,125	7,839	4,974	2,603	211
1988	15,656	8,812	6,400	3,672	291
1989	16,663	9,488	7,575	4,426	409
1990	17,702	10,168	8,255	4,773	482
1991	19,821	11,523	8,986	4,940	527
1992	21,229	12,418	10,110	5,351	682
1993	23,035	13,591	10,824	5,765	716
1994	26,010	15,422	11,752	6,397	915
1995	28,604	17,015	12,806	7,293	1,231
1996	33,758	20,231	14,055	8,096	1,436
1997	37,903	22,686	15,760	8,853	1,715
1998	45,758	27,885	16,694	8,769	1,657
1999	49,276	30,127	17,682	9,447	1,912
2000	51,891	31,530	19,064	10,354	2,137
2001	54,177	32,960	19,814	10,224	1,908
2002	56,073	33,997	20,941	10,144	1,946
2003	57,991	34,914	21,973	11,154	2,292
2004	60,429	36,331	23,365	12,554	2,680
2005	68,442	42,383	24,481	13,646	3,051
2006	70,568	44,044	28,137	15,402	3,098
2007	72,140	45,285	30,560	16,848	3,573
2008	72,554	45,891	31,359	14,936	2,901
2009	72,553	46,181	31,838	13,438	2,114
2010	72,462	46,278	32,290	15,075	2,663
2011	71,834	46,060	32,046	16,439	3,319
2012	70,201	44,997	31,425	16,223	3,218
2013	68,150	43,635	31,005	16,281	3,136
2014	66,007	42,110	30,240	5,321	881
2015	8,157	5,909	4,734	0	0
Total	1406,990	862,050	571,250	284,390	48,285

Notes: The following table shows the number of companies by a given year. *Full Sample* represents the number of SEDOL codes retrieved during the data collection. *After Duplicates Removed* represents the number of unique company-observations in a given year. *Stability Measure Constructed* shows the remaining number of companies after constructing the 5-year rolling standard deviation of the inverse hyperbolic sine of Earnings (the robustness check using Earnings Per Share figure does not influence the resulting number of observations). *Final Sample* column represents the number of companies in a given year after the following data manipulations

We drop the company observations between 1980 and 1983, since these do not have the 5-year rolling standard deviation of the inverse hyperbolic sine of Earnings constructed

We drop the companies for which 5-year rolling standard deviation of the price equals 0

We drop the highest and the lowest 2 percentiles based on the Earnings (EPS for robustness check)

We drop the highest and the lowest 2 percentiles based on the Price to Book Value ratio

We drop the highest and the lowest 5 percentiles based on the Price to Earnings ratio

We drop the companies for which I cannot construct PE and PBV ratio based on a 2-year average balance sheet or income statement figures

We drop the data for 2015 since these do not include necessary accounting data.

We include a company into *Subsample of Peers* if it is a member of a peer-group constructed on the basis of a *year, country, industry* (based on 3 digit SIC code) and *earnings stability quantile (We* construct 30

quantiles for every year). For this subsample We ignore companies if their peer-group includes less than 5 members

Table 1 describes the number of company-observations in a given year and the effect of abovementioned data manipulations. The original sample, referred to as *full sample*, contains 544,950 duplicate company-year observations that we delete. Furthermore, the introduction of the earnings stability measure decreases the remaining sample by another 290,800 company-years.[9] The outlier treatment process, data filtering and requirement of valuation ratios availability described above cause the number of company-years to decrease by further 286,860. The resulting *final sample* consists of 284,390 company-year observations from 105 countries from 1984 until 2014. This *final sample* is a basis for the regression analysis, however, for a company to be included in the valuation analysis we require it to be a member of a peer group that consist of at least 5 members. We construct these peer groups with respect to a *year*, *country*, *industry specification* and *earnings stability quantile*. Obviously, this requirement is very demanding and causes a substantial data reduction, but it has to be pursued in order to reflect a valuation practice. Due to the nature of indirect valuation method, insufficient number of peer companies would cause inconsistent and inaccurate results.

5. Methodology

5.1 Regression Analysis

In this subsection we describe statistical tests of the theory that the Market Value is proportional to Earnings in the case of the relatively most stable companies. We carry out the following regression (5) for company-year observations from *final sample* and *subsample of peer companies* conditional on the stability decile groups in three forms.[10] Firstly, panel regressions with company fixed-effects and company-clustered standard errors,[11] then panel regressions with between-company effects and year indicators and lastly, annual cross-sectional regressions.

$$ln(MarketValue) = \alpha + \beta \times ln(Earnings) + \varepsilon \tag{5}$$

In all cases, we test a general linear hypothesis that for the individual stability decile groups $\beta = 1$. Such a state essentially means, that a 1% increase in Earnings results in 1% increase in Market Value for companies within the specific stability decile. If the general linear hypothesis turns out valid, we consider this result as a justifying evidence for further empirical analysis.

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

[9] In case we broaden the window of the rolling standard deviation from 5 to 7 years for the robustness check purposes, the remaining sample consists of only 300,151 company-years (untabulated).
[10] The composition and difference between these samples is described in the data section.
[11] Clustering is beneficial in order to tackle heteroskedasticity.

In addition, 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).

We argue that the distinction between fixed-effects and between-effects regression establish a statistical background for two different types of valuation analysis, within company and between company valuation. Using argumentation of Wooldridge (2010), we acknowledge that our panel dataset contains time-series and cross-sectional information. 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. On the other hand, we attempt to capture the cross-sectional between-company information about the effect of Earnings on Market Value by utilizing between effects estimator. Based on the company fixed effects or between effects specification of the regression (5), we are able to test the general linear hypothesis and eventually document the PE ratio stability in the following ways.

First, in the case of favourable company-fixed effects regression results,[12] we argue that Market Value change proportionally with Earnings of the valued company. Thus, this setting provides statistical background that applying the last year's Price to Earnings ratio of the valued company on the current year's earnings figure will result in the most accurate and precise value estimate.

Second, in the case of favourable between-company effects regression results,[13] we argue that Market Value of the valued company is proportional to Earnings of its peers. Thus, application of the peer-group's median Price to Earnings ratio on the current year's earnings figure of the valued company will cause an improvement in valuation accuracy. This improvement occurs if the peer companies are drawn from the stability decile group for which the general linear hypothesis is favourable.

Lastly, we carry out annual cross-sectional regressions in order to test the general linear hypothesis of proportionality on a yearly basis. In addition, this setting provides us with opportunity to observe eventual trend in annual earnings coefficient and intersect estimates.

5.2 Valuation Analysis

In this paper we opt for valuation analysis approach to evaluate the valuation accuracy and precision of multiple based valuation techniques. Firstly, we calculate the valuation error and its dispersion for the within-company valuation method individually for every stability decile group, using solely the information about the valued company. Then, we calculate the valuation error and its dispersion for the between-company valuation method individually for every stability decile group, using the information extracted from the peer-group specific to a valued company. In the case of between-company valuation we introduce 4 methods of peer-group creation from which the *Benchmark* method constitutes the current best practice. Finally, we evaluate the argument of the market value being fully determined by the earnings in

[12] 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.

[13] Which is focused on the cross-sectional between-company relation between earnings and market value.

case of the relatively most stable companies by comparing the within-company valuation method results with the between-company method results. We evaluate the argument of between-company valuation results improvement as a consequence of the earnings stability inclusion as a peer-group creation criterion. We assess the peer-group creation method by comparing the valuation error and its dispersion for different methods of peer-group creation against the benchmark method.

First, 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.[14] 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 with empirical results 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:

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

Next, we conduct a between-company valuation analysis to evaluate accuracy and precision of different peer selection methods against the *Benchmark* method. This approach differs from the within-company valuation in the way we obtain the valuation multiple. Instead of using last year's Price-to-Earnings multiple of the valued company we consider this multiple to be unknown. We obtain the value estimate for company (*i*), 4 months after the fiscal year end (*t*) by multiplying the earnings of the valued company for the year (*T*) with the median value of Price to Earnings ratio implied by the peer group (α) of the valued company. Our choice of median value for peer group multiple follows Schreiner and Spremann (2007) who documented that median works better then harmonic mean or simple mean. The Price to Earnings ratios for the peer companies are calculated on a basis of the last 2 year's earnings, as in the within-company case. The following formula (8) explains this approach:

$$\widehat{Price}_{i,t} = Earnings_{i,T} \times Median_{j \in \alpha} \left\{ \frac{Price_{j,t}}{\frac{(Earnings_{j,T} + Earnings_{j,T-1})}{2}} \right\} \tag{8}$$

[14] 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.

For every company for which we apply the between-company valuation method, [15] we predict four different out of sample market values. These are attributable to following four peer group creation methods:

- The *Benchmark Method* represents the peer group creation that is being referred to as the current best practice. Peer firms have the same *year, country* and *industry* (specified by a 3 digit SIC code). This method of peer group creation is suggested by Alford (1992) and consensually accepted by academia and practitioners.
- *Method 1* is an extension of the Benchmark method. We introduce the stability quantile group inclusion as an additional condition for including the company-observation in a peer group. For this purpose, we sort the company-observations by their stability measure and create 30 stability quantile groups for every year. Hence, peer firms based on the *Method 1* have the same *year, country, industry* and are included in the same *stability quantile group.*
- *Method 2* is derived from the Method 1. Unlike for Method 1, we drop the requirement of company-observations to be drawn from the same *country*. We follow this procedure in order to outline potential costs or benefits of trading the information contained in the country specification for more numerous peer groups.
- For the *Method 3,* we create peer groups based on the *year* of the company-observation and the *inclusion in one of the 300 annual earnings stability quantile groups.* Hence, peer firms have the same *year* and are included in the same *stability quantile.*

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 (9) Absolute Valuation Error expressed as a difference between the predicted and observed market value deflated by the observed market value, (10) Absolute Logarithmic Valuation Error as absolute difference between the logarithm of the predicted and observed market value, and (11) 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 follows:

$$Absolute\ Valuation\ Error\ = \frac{|\widehat{MarketValue}_{i,t} - MarketValue_{i,t}|}{MarketValue_{i,t}} \tag{9}$$

$$Abs.Log\ Valuation\ Error = |log\left(\widehat{MarketValue}_{i,t}\right) - log(MarketValue_{i,t})| \tag{10}$$

$$Squared\ Valuation\ Error\ = \left(\frac{\widehat{MarketValue}_{i,t} - MarketValue_{i,t}}{MarketValue_{i,t}}\right)^2 \tag{11}$$

[15] These are the companies belonging to the *Subsample of Peer Companies.* Creation of this sample is described in the Data section of this research paper.

We use paired t-tests to test for the equality of absolute valuation error means between the valuation methods 1-3 and the benchmark method. These are carried out across the 10 stability decile groups as well as for the sample as a whole. We consider the benchmark method to be dominated in terms of valuation accuracy in case that the alternative method provides lower mean absolute valuation error and this is considered significant by the t-test.

After the valuation accuracy, we describe the distributional characteristics of the valuation error in order to evaluate the valuation precision of each method. We evaluate the distributional characteristics, hence valuation precision, by observing the interdecile and interquartile range of the absolute valuation error.[16] We calculate the interdecile range as the difference between the value of the 90^{th} and 10^{th} percentile of the Absolute Valuation Error. The interquartile range represents the difference between the value of the 75^{th} and 25^{th} percentile of the Absolute Valuation Error. We compare the statistics across the stability decile groups as well as for the whole sample and consider the method with the lowest values as dominant in terms of valuation precision.

All empirical analyses, as described above for the Price to Earnings ratio, are replicated for the Price to Book Value ratio in exactly the same way.

6. Analysis and Results

6.1 Descriptive Statistics

Table 2 provides medians of basic descriptive and financial statistics resulting from 2 different specifications of the stability measure. We provide these results in an attempt to describe common signs of a stable company for which we hypothesize significant improvement in PE and PBV multiple valuation methods. Panel A reports result for the "base case" stability specification where the stability measure is constructed using aggregate Earnings Before Extraordinary Items, while Panel B represents the case where stability measure is constructed using Return on Equity.[17]

Focusing on a Panel A, where stability is defined by the volatility of the earnings stream, we conclude the following. Stable companies, for which the proposed PE and PBV valuation method is expected to yield lower valuation error, are valued relatively conservatively with respect to their PE ratio. On the other hand, the median PBV ratio is slightly higher for stable companies than for the average company drawn from the *final sample*. In terms of enterprise value to sales the most stable companies are by far the most valuable. In addition, the most stable companies tend to have the lowest amount of debt capital, measured by Debt to Equity ratio, this fact in conjunction with stable earnings stream indicates their high creditworthiness resulting in the lowest Cost of Debt capital. As hypothesized in the 3^{rd} section of this paper, the most stable companies are likely to have the property of operational results

[16] We use the standard deviation as a complementary statistic, although we discuss why it is not a good measure of valuation precision.

[17] We report descriptive statistics for these two stability measure specifications since all other stability measure specifications discussed further in the robustness check section tend to have nearly identical statistics either to the base case or Return on Equity specification.

predictability that might be the factor behind the highest dividend yield and lowest reinvestment rate of these companies.[18]

Panel B clearly demonstrates how the characteristics of a stable company changes after specifying the stability measure by using Return on Equity. The PE and PBV valuation multiples show exactly opposite trend compared to the previous stability specification. We can conclude that for the alternative stability specification, in terms of ROE variability, companies yielding the most stable Return on Equity are valued by the highest median PE ratio, although the median ROE for these companies is the lowest from all stability decile groups. On the other hand, the median PBV ratio is the lowest from the whole sample. We explain this fact by referring to the 3rd section of this research paper where we derived the argument for PBV ratio stability. As it is apparent, in the case when ROE equals Cost of Equity, assuming the clean surplus relation, the PBV value equals 1. Since companies yielding consistent and not volatile Return on Earnings are perceived as stable, the risk premium charged for the equity capital should be lower and possibly closer to the Return on Earnings than for less stable companies (Gebhardt, Lee, & Swaminathan, 2001). All other statistics show essentially the same trend with decreasing company stability as they show for the first specification of the stability measure.

To conclude, while the description of some valuation multiples differ across different stability specifications, we claim that regardless of this specification the following characteristics of stable companies are present. (1) Stable companies have higher enterprise value multiple than their less stable counterparts. (2) Generally, they rely less on the debt financing. (3) These two characteristics in conjunction with the perception of their stability result in lower cost of debt capital. (4) They are capable of committing to a dividend policy with higher dividend yield, which might be a result of a lower earnings retention requirement since they (5) usually invest less in capital expenditures. These findings generally support those of Lev (1983) as well as Hunt et al. (2000).

[18] We measure the reinvestment rate as Capex to Assets. At the same time, we acknowledge that the ratio of Capex to Depreciation and Amortization represents a more truthful measure of actual reinvestment. However, the data on D&A are very sporadic and do not permit me to construct this measure comprehensively embracing most of the company-observations in dataset.

Table 2 Financial Statistics by Stability Decile Groups

Panel A. Stability measure based on the aggregate earnings

Stability Decile	*Median Statistics*								
	Price to Earnings	**Price to Book Value**	**Enterprise Value to Sales**	**ln (Total Assets)**	**Debt to Equity**	**Capex to Assets**	**Return on Equity**	**Cost of Debt**	**Dividend Yield**
1	15.943	1.803	1.880	14.469	37.6%	3.5%	10.9%	4.7%	2.5%
2	16.179	1.824	1.653	14.596	38.2%	3.7%	11.2%	5.0%	2.1%
3	16.533	1.836	1.567	14.623	40.3%	3.9%	11.2%	5.1%	1.9%
4	16.789	1.804	1.499	14.644	41.1%	3.8%	10.9%	5.2%	1.7%
5	17.172	1.777	1.441	14.630	41.0%	3.9%	10.8%	5.4%	1.6%
6	17.469	1.762	1.429	14.618	43.1%	3.8%	10.5%	5.4%	1.4%
7	18.045	1.721	1.419	14.583	44.5%	3.8%	10.1%	5.6%	1.3%
8	18.577	1.676	1.359	14.527	47.0%	3.7%	9.6%	5.7%	1.2%
9	19.687	1.686	1.361	14.327	48.6%	3.8%	9.2%	5.7%	1.0%
10	20.437	1.747	1.446	14.125	48.1%	3.6%	9.5%	6.0%	0.9%
Total	17.243	1.772	1.503	14.542	42.5%	3.8%	10.6%	5.3%	1.6%

Panel B. Stability measure based on the return on equity

Stability Decile	*Median Statistics*								
	Price to Earnings	**Price to Book Value**	**Enterprise Value to Sales**	**ln (Total Assets)**	**Debt to Equity**	**Capex to Assets**	**Return on Equity**	**Cost of Debt**	**Dividend Yield**
1	20.532	1.353	1.749	15.123	37.0%	2.3%	6.3%	3.6%	1.8%
2	18.634	1.421	1.547	15.284	41.1%	2.9%	7.5%	4.1%	1.7%
3	17.987	1.525	1.480	15.010	42.9%	3.2%	8.6%	4.6%	1.7%
4	17.288	1.605	1.442	14.751	44.6%	3.5%	9.6%	5.0%	1.7%
5	16.751	1.679	1.379	14.580	45.2%	3.9%	10.6%	5.4%	1.7%
6	16.500	1.805	1.426	14.425	44.7%	4.0%	11.8%	5.7%	1.6%
7	16.104	1.906	1.439	14.305	44.2%	4.3%	13.0%	5.9%	1.6%
8	15.901	2.103	1.561	14.183	41.1%	4.4%	14.5%	6.3%	1.5%
9	15.685	2.378	1.697	13.983	39.2%	4.4%	16.4%	6.6%	1.3%
10	15.079	2.975	1.855	13.613	42.6%	3.9%	19.0%	6.7%	0.9%
Total	17.152	1.755	1.523	14.518	42.5%	3.7%	10.7%	5.3%	1.6%

Notes: This table provides descriptive statistics of the individual stability decile groups for two specification of the stability measure. Panel A reports statistics attributable to the stability decile groups constructed on a 5-year rolling standard deviation of the inverse hyperbolic sine of earnings before extraordinary items in undeflated form. Panel B reports the same statistics while deflating the aggregate earnings by average value of common equity, hence Return on Equity. All ratios are created on a 2-year arithmetic average of the balance sheet figures and income statement figures. Inherent noise may be introduced since availability of data for some of these ratios is not a criterion for a company-year observation in order to be included in the analysis. The Capex to Assets, Cost of Debt and Dividend Yield is available only for a substantially limited amount of company-year observations from the *final sample.*

7.7 Regression Results

Company Fixed Effects Regressions

Table 3 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 3 provides results for the whole sample, while Panel B presents results for the subsample of peer companies.[19]

The results for the regressions with company fixed effects indicate the following. Throughout the whole sample the earnings coefficient decreases gradually as company stability decreases.[20] 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 3, we find that the results change 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 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.

We argue that the monotonic increase of the intercept with decreasing company stability is the effect of increasing present value of growth options capitalized into market value of less stable companies, in other words "capitalization of hope". For the purpose of this statement we assume hypothetical existence of a company with Earnings equalling 1.000 in every stability decile group. For such a company the earnings term from the equation (7) zeroes out. In this hypothetical case, the Market Value of the company equals 10 to the power of the intercept, which essentially means that unstable company earning 1.000 would be valued higher than stable company with the same earnings. This finding is in line with that of Lamp (2014) who provides empirical evidence on the existence of stable and unstable companies. He argues that while stable companies manage to have consistently positive but low earnings, in the case of unstable companies investors tolerate negative earnings and earnings variability. Arguably, this willingness to invest in unstable loss making companies comes from the vision of realizing the future growth option.

[19] Both, *final sample* and *subsample of peer companies* are defined in the data section. We make the distinction between the samples in order to establish statistical background for valuation analysis comparison of both samples.

[20] Except for the 2nd stability decile group for which the coefficient is even slightly higher than for the most stable decile group.

Table 3 Regression Coefficient by Earnings Stability Decile - Company Fixed Effects

Panel A. Full sample

	Stability Decile									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
lnEARN	0.801*** (0.770-0.832)	0.812*** (0.790-0.834)	0.777*** (0.758-0.796)	0.720*** (0.702-0.738)	0.664*** (0.643-0.684)	0.560*** (0.541-0.579)	0.470*** (0.452-0.489)	0.362*** (0.343-0.381)	0.265*** (0.252-0.279)	0.199*** (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***
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 peers

	Stability Decile									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
lnEARN	1.012*** (0.947-1.077)	0.898*** (0.839-0.957)	0.856*** (0.803-0.909)	0.825*** (0.766-0.884)	0.754*** (0.668-0.839)	0.644*** (0.564-0.723)	0.441*** (0.371-0.510)	0.338*** (0.273-0.403)	0.359*** (0.257-0.461)	0.225*** (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***
N	3,788	3,677	3,245	2,847	2,420	2,162	1,863	1,585	1,243	937

Notes: * *p*<0.05; **p<0.01; ***p<0.001

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 the *final 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 before extraordinary items. Panel B represents the results for the *Subsample of Peers*. I define a peer-company as one being drawn from the subsample of companies from the same *year, country, industry* and *earnings stability quantile*. In order to include the company into analysis its peer-group has to constitute of at least 5 companies.

$$ln(Market\ Value_{i,t}) = \alpha + \beta * ln(Earnings_{i,T}) + \varepsilon$$

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 different from 1.000

Between Company Effects Regressions

Table 4 shows earnings coefficient estimates for the same regression using between company effects and year indicator variables (untabulated). Generally, the tenor of the results is very similar to the company fixed effects estimates. For the *final sample*, presented in the Panel A of the Table 4, the Earnings of other companies from the given decile group determine the Market Value of a company gradually less as the stability of the company decreases. This is documented by gradually decreasing earnings coefficient with decreasing company stability. The hypothesis that the coefficients are equal to one is rejected for all slope coefficients in Panel A on a 95% confidence level.

On the other hand, after specifying the requirement that every company, in order to be included in the analysis, has to be included into a peer group consisting of at least 5 members, the results change significantly.[21] These results are presented in the Panel B of the Table 4. The overall trend of decreasing earnings coefficients with decreasing company stability remains. In addition, the estimated coefficients become higher for the first 7 stability decile groups. More importantly, the earnings coefficients for the first two stability decile groups meet the general linear hypothesis on the 95% confidence level. The results for the two most stable decile groups indicate, that the Market Value of an average company from these decile groups is proportional to Earnings of its peers. Additionally, all year indicators and the intercept are insignificant in the case of the first decile group. This result suggests that in the case of the most stable decile group Earnings are proportional to Market Value and explain Market Value exceptionally well.

Summary of the Regression Results

To summarize, we conduct company fixed effects and between company effects panel regressions in order to isolate the effect of Earnings on Market Value in within company and between company settings. We provide evidence in favour of the general linear hypothesis of earnings coefficient being equal to one for the most stable companies in both settings, company fixed and between company effects. We further support these findings by annual cross-sectional regressions for which the general linear hypothesis is met as well (untabulated). We conclude that the results for the subsample of peer companies, and particularly those for the most stable decile group, provide favourable and noteworthy statistical foundations for the theory that for these relatively stable companies the Market Value is proportional to Earnings.

[21] These requirements are that the company-year observation is from the same *year*, *country*, *industry* and one of the 30 *stability quantile groups.*

Table 4 Regression Coefficients by Earnings Stability Decile - Between Effects Estimator with Time Fixed Effects

Panel A. Final sample regression

	Stability Decile									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
lnEARN	0.938*** (0.931-0.944)	0.940*** (0.934-0.946)	0.938*** (0.932-0.944)	0.934*** (0.928-0.940)	0.931*** (0.925-0.936)	0.925*** (0.919-0.931)	0.917*** (0.911-0.923)	0.908*** (0.901-0.914)	0.893*** (0.886-0.901)	0.863*** (0.854-0.873)
Constant	3.853***	3.931***	3.614***	3.857***	3.707***	3.426***	4.020***	3.819***	3.772***	4.640***
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 peers regression

	Stability Decile									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
lnEARN	0.987*** (0.971-1.002)	0.998*** (0.987-1.010)	0.976*** (0.964-0.987)	0.965*** (0.954-0.977)	0.965*** (0.952-0.978)	0.972*** (0.957-0.987)	0.941*** (0.925-0.957)	0.905*** (0.885-0.926)	0.864*** (0.839-0.888)	0.791*** (0.757-0.825)
Constant	1,925	1.919***	2.418***	2.235***	2.781***	2.537***	4.178***	3.560***	3.734***	7.030***
N	3,788	3,677	3,245	2,847	2,420	2,162	1,863	1,585	1,243	937

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

This table shows the regression coefficients from the regression of ln(Market Value) on ln(Earnings) and year indicator variables (untabulated results), with applied between-company effects on the *final sample* of all companies, presented in Panel A, and on the *Subsample of Peers* presented in Panel B. The adjustments to the *full sample* in order to obtain the *final sample* are as follows. We construct Earnings Per Share, Price to Book Value and Price to Earnings percentiles in every year. In every year, we drop the highest and the lowest two percentiles based on Earnings Per Share and Price to Book Value, as well as, the highest and the lowest five percentiles of Price to Earnings. We further drop all companies with price lower than 1 nominal currency unit and companies for which 4 year rolling standard deviation of the price equals 0. The inclusion into the *Subsample of Peers* is conditional on number of companies in a peer group constructed for every company based on the *year, country, industry* and *stability quantile group inclusion*. We include the company-observation into the analysis in case its peer group consists of at least 5 companies

This regression can be described as follows:

$\ln(\text{Market Value}) = \alpha + \beta \times \ln(\text{Earnings}) + \gamma \times i.\text{year} + \varepsilon$

Although we carry out the regression analysis with time fixed effects, we do not report the results for the individual γ coefficients

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

7.1 Valuation Results

Building on the favourable statistical results we carry out a valuation analysis for two purposes. (1) In order to observe which method, within or between company PE valuation, dominates for the most stable companies in terms of valuation accuracy and precision.[22] And (2) in order to empirically study the incremental enhancement of the multiple valuation accuracy and precision caused by introduction of company stability as an additional peer group selection criterion. We observe that within-company valuation dominates the between company valuation for the three most stable decile groups in both accuracy and precision. We demonstrate that after the company stability is introduced as peer selection criterion in the between company valuation, the valuation precision and accuracy of the PE multiple increases significantly for average company and radically for relatively stable companies.[23]

Within Company Valuation[24]

Table 5 provides results of the within company PE valuation for the final sample (Panel A) and the subsample of peer companies (Panel B). While these results are intended to be used in comparison with the between company valuation in order to argue which method is the dominant one, the following facts are noteworthy.

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.[25] This pattern does not hold for the squared and log valuation errors. In the case of squared valuation error this is a sign that within the stability decile groups with high values of squared error, extreme values of valuation error are present. The log valuation error shows that the average estimated values are mostly understated for the *final sample* (untabulated).

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. Moreover, this action stabilizes the trend of the mean squared valuation error. This measure continually increases with decreasing company stability, which indicates that comparing to the final sample, presented in the Panel A, the subsample of peer companies does not include company-observations with extreme values of valuation error. In addition, within-company PE valuation method on average overstates the value, which we observe from positive nominal mean log valuation error (untabulated).

[22] Since for the companies from the most stable decile group we obtain a favourable regression results for both company fixed effects and between company effects setting, the following comparison of within and between company valuation methods is needed.

[23] We also tabulate complementary results for the PBV multiple since the incremental enhancement in valuation accuracy is equally pronounced.

[24] This valuation method requires that the last year's PE ratio of a given company is known, hence that the company is publicly traded. For instance, this means that this method cannot be used to estimate value of IPOs.

[25] We claim that the absolute valuation error as a percentage of realized market value provides reasonable measure of valuation accuracy since its deflated form marginalizes the effect of extreme nominal values. In addition, reporting on this measure is standardly pursued by academics (Alford, 1992).

Table 5 Firm-Specific PE Valuation Error Analysis

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

Notes: 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:

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

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*.

Table 6 Results of the Between-Company PE and PBV Valuation Method by Earnings Stability Deciles

Panel A. Price to earnings

Earnings Stability Decile	*Mean Absolute Valuation Error*				*Mean Absolute Log Valuation Error*				*t-test*		
	Benchmark	**Method 1**	**Method 2**	**Method 3**	**Benchmark**	**Method 1**	**Method 2**	**Method 3**	**Benchmark vs Method 1**	**Benchmark vs Method 2**	**Benchmark vs Method 3**
1	0.361	0.337	0.347	0.497	0.324	0.301	0.314	0.556	9.058***	1.564	-12.500***
2	0.398	0.372	0.365	0.511	0.342	0.316	0.350	0.566	8.474***	-0.367	-5.970***
3	0.418	0.403	0.426	0.547	0.370	0.350	0.394	0.594	3.925***	-2.061*	-7.013***
4	0.430	0.416	0.455	0.576	0.402	0.381	0.418	0.626	3.573***	-2.219*	-14.649***
5	0.460	0.447	0.569	0.617	0.434	0.413	0.470	0.657	3.591***	-2.565*	-12.904***
6	0.489	0.479	0.556	0.667	0.473	0.450	0.514	0.694	2.431**	-3.407***	-8.763***
7	0.576	0.569	0.613	0.721	0.553	0.528	0.573	0.740	1,498	-3.414***	-5.504***
8	0.604	0.611	0.680	0.777	0.630	0.607	0.649	0.803	-0,749	-3.593***	-11.764***
9	0.654	0.662	0.753	0.872	0.724	0.701	0.725	0.909	-1,320	-4.668***	-10.524***
10	0.771	0.788	0.882	0.979	0.898	0.883	0.861	1.051	-2.588***	-2.162*	-6.350***
Total	0.494	0.484	0.507	0.656	0.484	0.462	0.469	0.698	3.190***	-2.220*	-9.681***

Table 6 (continued) Results of the Between-Company PE and PBV Valuation Method by Earnings Stability Deciles

Panel B. Price to book value

Earnings Stability Decile	*Mean Absolute Valuation Error*				*Mean Absolute Log Valuation Error*				*t-test*		
	Benchmark	**Method 1**	**Method 2**	**Method 3**	**Benchmark**	**Method 1**	**Method 2**	**Method 3**	**Benchmark vs Method 1**	**Benchmark vs Method 2**	**Benchmark vs Method 3**
1	0.376	0.354	0.429	0.612	0.355	0.324	0.353	0.643	5.488***	-0.106	-19.325***
2	0.409	0.383	0.410	0.630	0.369	0.336	0.374	0.661	7.156***	-2.180*	-12.474***
3	0.423	0.390	0.468	0.657	0.390	0.349	0.401	0.685	7.518***	-3.637***	-15.307***
4	0.427	0.394	0.491	0.674	0.405	0.361	0.417	0.706	7.114***	-3.018**	-23.192***
5	0.467	0.431	0.550	0.688	0.430	0.386	0.454	0.721	7.251***	-3.749***	-16.247***
6	0.512	0.476	0.518	0.714	0.446	0.398	0.449	0.728	6.697***	-2.439**	-7.909***
7	0.569	0.523	0.544	0.723	0.484	0.431	0.458	0.732	8.892***	0,142	-5.745***
8	0.559	0.524	0.560	0.745	0.491	0.445	0.481	0.733	4.833***	0,733	-11.006***
9	0.577	0.545	0.561	0.761	0.510	0.468	0.484	0.751	4.776***	0,782	-6.595***
10	0.604	0.574	0.615	0.795	0.537	0.499	0.491	0.756	3.757***	1,549	-5.118***
Total	0.478	0.446	0.494	0.693	0.431	0.390	0.421	0.708	6.524***	-1,436	-12.845***

Notes: * p < 0.05; ** p< 0.01; *** p < 0.001

This table shows the results of four different between-company methods of the Price to Earnings (panel A) and Price to Book Value (panel B) valuation analysis application. We derive the Market value (hereby "MV") estimate by multiplying the value driver (Earnings Per Share or Book Value of Equity Per Share) by the peer group's median value of that value driver. Then we create absolute and absolute log valuation error as follows:

$\widehat{MV_{i,t}} = Earnings_{i,T} * Median_{j \epsilon \alpha}\left\{\frac{MV_{j,t}}{\frac{Earnings_{j,T}+Earnings_{j,T-1}}{2}}\right\}$ $\widehat{MV_{i,t}} = Book\ Value_{i,T} * Median_{j \epsilon \alpha}\left\{\frac{MV_{j,t}}{\frac{Book\ Value_{j,T}+Book\ Value_{j,T-1}}{2}}\right\}$ $\varepsilon_{i,t} = \frac{|\widehat{MV_{i,t}} - MV_{i,t}|}{MV_{i,t}}$ $\varepsilon_{i,t} = \left|log\left(\widehat{MV_{i,t}}\right) - log(MV_{i,t})\right|$

Benchmark method is based on the peer group created with respect to a given *year*, *country* and *industry classification* (based on a 3 digit SIC code)
Method 1 is based on the peer group created with respect to a given *year*, *country*, *industry classification* and the inclusion into group based on 30 *earnings stability quantiles* for a given year.
Method 2 is based on the peer group created with respect to a given *year*, *industry classification* and the inclusion into group based on 30 *earnings stability quantiles* for a given year.

Between Company Valuation

Table 6 provides results on the between company valuation accuracy for 4 different peer group selection methods applied on the PE multiple (Panel A) and the PBV multiple (Panel B) valuation technique. The accuracy of the between company valuation, measured by absolute valuation error, decreases as the stability of companies decreases for both, PE and PBV, valuation techniques. More importantly, the peer selection *Method 1*, which is essentially the current best practice method adjusted for company stability criterion, results in significantly more accurate value estimate for both, PE and PBV, techniques than the *Benchmark* peer selection method. This is documented under the *Total* line. While in the case of the PE valuation technique the *Benchmark* method yields on average 49.4% valuation error, *Method 1* decreases the valuation error to 48.4%. The mean difference of 1.0% is significant on 0.1% confidence level with the t-statistic of the paired t-test equalling 3.190. In addition, in the case of the PBV valuation technique, *Method 1* decreases the absolute valuation error on average by surprising 3.2%, this result is also significant on the 0.1% confidence level with t-statistic of 6.524. Comparing the results of PE and PBV valuation technique we find that peer selection *Method 1* applied on the PBV valuation result in more accurate value estimates than application of this method on the PE valuation technique.

Evaluating the results for the disaggregated sample into 10 stability decile groups we point out a significant improvement in the valuation accuracy by as much as 2.4% for the PE multiple technique and 2.2% for the PBV multiple technique in the case of the most stable companies. The PE multiple technique (Table 6; Panel A) is significantly more accurate after introduction of the stability criterion in *Method 1* for the first 6 stability decile groups. In the case of the relatively least stable companies, stability decile group 10, the *Method 1* is significantly outperformed by the conventional *Benchmark* method. The advanced *Method 1* dominates the *Benchmark* method in the case of PBV valuation technique (Table 6; Panel B), throughout all stability decile groups as documented by significantly lower mean absolute valuation error.

Lastly, we point out that matching peer companies purely on their relative stability and applying PE multiple valuation result in lower valuation error than random peer selection method.[26] Comparing the valuation accuracy result of the *Method 3* to the valuation accuracy of random peer selection method we find that the random peer selection is dominated throughout all stability decile groups (untabulated). The difference of 20.7% in valuation accuracy, for average company, between the random selection method and the *Method 3* points out that relative earnings stability does indeed embrace many idiosyncrasies of companies as predicted in the hypothesis development section.

[26] We carry out random peer selection by randomly choosing 5 company-observations from the same *year* and applying median multiple of these companies on the earnings of the valued company.

Table 7 Descriptive and Distributional Statistics for the Between-Company PE and PBV Valuation Method by Earnings Stability Deciles

Panel A. Price to earnings

Earnings Stability Decile	*Standard Deviation*				*Interquartile Range*				*Interdecile Range*			
	Benchmark	Method 1	Method 2	Method 3	Benchmark	Method 1	Method 2	Method 3	Benchmark	Method 1	Method 2	Method 3
1	0.778	0.789	1.296	0.560	0.359	0.336	0.346	0.503	0.748	0.718	0.706	0.931
2	1.046	1.066	0.488	0.546	0.367	0.328	0.367	0.509	0.753	0.713	0.791	0.947
3	1.083	1.126	0.781	0.689	0.379	0.353	0.420	0.529	0.772	0.739	0.870	1.006
4	0.557	0.600	1.084	0.596	0.406	0.384	0.432	0.550	0.813	0.775	0.859	1.089
5	0.739	0.749	4.180	0.660	0.414	0.400	0.459	0.568	0.815	0.827	0.935	1.175
6	0.993	1.007	0.869	0.803	0.451	0.435	0.494	0.577	0.844	0.832	1.027	1.289
7	1.346	1.361	0.854	0.935	0.485	0.485	0.513	0.608	0.904	0.912	1.094	1.411
8	0.752	0.976	0.965	1.082	0.528	0.532	0.555	0.610	0.972	1.008	1.239	1.497
9	0.908	0.985	1.081	1.008	0.577	0.586	0.630	0.621	1.004	1.010	1.298	1.729
10	1.548	1.590	1.490	1.282	0.659	0.664	0.661	0.640	1.207	1.276	1.443	1.959
Total	0.994	1.038	1.633	0.827	0.474	0.467	0.491	0.599	0.881	0.880	0.936	1.241

Panel B. Price to Book Value

Earnings Stability Decile	*Standard Deviation*				*Interquartile Range*				*Interdecile Range*			
	Benchmark	Method 1	Method 2	Method 3	Benchmark	Method 1	Method 2	Method 3	Benchmark	Method 1	Method 2	Method 3
1	0.766	0.818	1.743	0.917	0.379	0.376	0.427	0.571	0.756	0.759	0.873	1.177
2	1.107	1.126	0.694	0.738	0.391	0.402	0.456	0.573	0.783	0.793	0.901	1.226
3	0.940	0.973	0.982	0.801	0.418	0.411	0.509	0.595	0.829	0.818	0.989	1.293
4	0.597	0.671	1.017	0.785	0.422	0.430	0.522	0.596	0.850	0.836	1.078	1.360
5	0.892	0.892	2.093	0.807	0.446	0.464	0.586	0.609	0.888	0.902	1.117	1.364
6	1.613	1.644	0.904	0.855	0.471	0.469	0.587	0.616	0.941	0.923	1.122	1.438
7	1.711	1.727	0.979	0.935	0.513	0.512	0.601	0.612	1.051	0.993	1.211	1.448
8	0.827	0.917	1.073	1.191	0.537	0.546	0.639	0.623	1.166	1.090	1.263	1.536
9	1.271	1.342	1.076	0.930	0.561	0.563	0.665	0.632	1.179	1.118	1.208	1.573
10	1.430	1.457	1.254	1.235	0.557	0.576	0.652	0.645	1.181	1.116	1.262	1.635
Total	1.141	1.176	1.253	0.913	0.461	0.463	0.535	0.608	0.916	0.899	1.035	1.386

Notes: This table provides complementary information on the distribution of the absolute valuation error by Earnings Stability Decile Groups for between-company valuation approach for PE (Panel A) and PBV (Panel B) valuation method. We construct the Interquartile Range as value of the 75th percentile less value of the 25th percentile of the absolute valuation error and Interdecile Range as a value of the 90th percentile less value of the 10th percentile of the absolute valuation error. These values refer to the results of the peer group construction method stated in the column heading. (For the method description see previous table).

Table 7 conveys information about the precision of the between company valuation for 4 different peer selection methods applied on the PE multiple (Panel A) and PBV multiple (Panel B) valuation technique. Focusing on the aggregate results under the *Total* line the results indicate the following findings. Firstly, the *Method 1* dominates the *Benchmark* method and two remaining methods in terms of the interquartile and interdecile distributional characteristics for PE valuation technique. Second, the PE valuation technique, particularly the peer selection *Method 1*, provides on average the most precise valuation results, measured by interquartile and interdecile range. Third, if valuation precision is measured by the standard deviation of absolute valuation error, then all adjusted methods are dominated by the *Benchmark* method. However, we argue that the standard deviation is more sensitive to extreme values than interquartile or interdecile range.[27] Nevertheless, the lower standard deviation of absolute valuation error for the *Benchmark* method signifies that although this method is less precise in terms of interquartile and interdecile range, it provides value estimates resulting in less extreme valuation errors.

Assessing the distributional characteristics of between company valuation within the individual decile groups, we find that the peer selection *Method 1* outperforms the precision of the *Benchmark* method. On average, peer selection *Method 1* results in more precise value estimate than the *Benchmark* method for the PE valuation technique (documented under *Total* line; Table 7; Panel A). Peer selection *Method 1* is more precise, for the PE valuation technique than the *Benchmark* method, in case of the first 7 and 6 stability deciles in terms of interquartile and interdecile range respectively (Table 7; Panel A). On the other hand, we cannot state a clear conclusion on the valuation precision of the *Method 1* in the case of PBV valuation technique (Table 7; Panel B), due to contradictory results of interquartile and interdecile range of absolute valuation error.

Summary of the Valuation Results

To summarize, (1) PE multiple valuation technique provides the most accurate and precise value estimate for the relatively most stable companies. (2) Comparing the within and between company PE valuation we conclude that, on average, within company valuation technique outperforms between company valuation for companies belonging to the first four stability decile groups in terms of valuation accuracy and valuation precision.[28] Therefore, we recommend this method to be used in case of the relatively most stable companies if it is possible to calculate their last year's PE ratio. (3) We document a significant improvement in between company valuation accuracy and precision for the PE valuation technique after applying the relative stability measure as a peer selection criterion. While we document improvement in valuation accuracy for PBV valuation method, the results are inconclusive regarding the precision of the PBV valuation method. (4) The application of the relative earnings stability measure in the peer selection process results in either value estimates that

[27] Therefore, we judge the valuation precision by interquartile and interdecile range.

[28] We reach this conclusion by comparing the absolute valuation error and interdecile and interquartile ranges of this metric presented for the *subsample of peer companies* for within-company PE multiple valuation (Table 5; Panel B) with the same measures for the between company-valuation method (Table 6; Panel A) and (Table 7; Panel A)

yield, on average, valuation errors closer to zero or tends to understate the estimated value in cases when the traditional peer selection method tends to overstate them.[29] (5) The PBV multiple technique based on the stability adjusted peer selection method is, on average, more accurate than PE multiple technique, while the PE technique is, on average, more precise.

8. Conclusion and Discussion

In conclusion, building on the current knowledge and exploiting the evidence of residual income valuation model's superiority, we argue that stable companies have Market Value proportional to Earnings. In order to develop this argument, we specify the construct of company stability and express assumptions required in order for the argument to hold. Firstly, we define stability of a company by low variation in aggregate earnings stream and argue that this stability construct is captured by a 5-year rolling standard deviation of the inverse hyperbolic sine of earnings before extraordinary items attributable to common equity. Second, we assume constant cost of equity capital, book value of equity and the clean surplus relation for stable companies and provide arguments why these assumptions are likely to be fulfilled, or at least closely approximated, in economic reality.

Our results may be practically relevant for stock market trading. There may be economically profitable returns obtained by following a trading strategy in which shares of undervalued companies would be bought and shares of overvalued companies sold. Undervalued companies are those with current PE ratio lower than the current median PE ratio of peer groups constructed on the basis of our *Method 1* model. Overvalued companies have current PE ratio higher than the current median PE ratio of comparable firms group constructed on the basis of our *Method 1* model. As we argued in the Analysis and Results section, our *Method 1* model either provides more accurate out of sample value estimates or understates the out of sample value estimates when standard industry classification *Benchmark* method overstates it. These properties of our *Method 1* model are very favourable for a construction of profitable trading strategy.

We test the argument of Market Value and Earnings proportionality for stable companies by regression analysis and find it is valid. We conduct company fixed effects and between company effects panel regressions of Market Value on Earnings in logarithmic form. We test a general linear hypothesis that the earnings coefficient is equal to 1 in order to test the validity of the PE ratio stability argument. The linear hypothesis is met in both cases, fixed effects and between effects estimator. Therefore, we declare the argument of Market Value and Earnings proportionality and PE ratio stability to be valid in the case of the most stable companies.

We test the argument of Market Value and Earnings proportionality empirically by conducting valuation analysis to find that (1) the PE multiple valuation technique

[29] This argument is based on the untabulated Log Valuation Error results for the between company valuation method. Clearly, the most accurate and precise method, which would consistently yield mean Log Valuation Error equalling 0 with the highest precision, is favourable. However, while such a method is not available we argue that method that slightly understates the estimated value is preferred over the method that overstates it by the same amount. This reflects a conservative approach to valuation that guards against overpricing.

provides the most accurate and the most precise value estimate for the relatively most stable companies. (2) For the relatively most stable companies, within company PE valuation outperforms between company valuation in both, accuracy and precision, and should be used if possible. If this is not possible, (3) between company PE valuation outperforms between company PBV valuation in both, accuracy and precision. After adjusting the *Benchmark* peer selection method by utilizing relative stability as peer selection criterion we find the following. (4) Between company PE and PBV valuation techniques yield significantly more accurate results than those for the *Benchmark* method. (5) PBV multiple valuation provides more accurate value estimates than PE multiple valuation for the average company. (6) PE multiple valuation provides more precise value estimates than PBV multiple valuation for the average company. Overall, adjusting the current best practice method of peer selection by introducing a stability criterion significantly improves the valuation results in terms of accuracy and precision. These results are robust against numerous methods of stability construct operationalization.

Lastly, descriptive statistics of different median financial measures reveal average characteristics of a "stable company". We find that these companies tend to have higher enterprise value, utilize less debt in their capital structure, pay lower interest on debt capital, distribute the highest amount of earnings by dividend payments and have the lowest reinvestment ratio. These results generally meet the statements and findings of Lev (1983).

To synthesize, if one is conducting an indirect valuation, she should match the valued company with its industry peers on the basis of their earnings stability. If this valuation is conducted on an exceptionally stable, and publicly traded company, one should use its last year's PE ratio in order to obtain a 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.

Our economic insights are geared towards the mainstream publicly traded companies. The process of validation of our sample and elimination of outliers and extreme observations makes our results applicable for a bulk of public companies which describe sufficiently long history of stock exchange trading with profitable earning characteristics. Our technique is not suitable for start-ups in new businesses, distressed companies, banks facing regulatory turmoil, for emerging market upstarts or for multinationals that spread across geographies and businesses. For such out-of-mainstream companies Damodaran (2018) provides a better compendium of alternative valuation metrics.

APPENDIX

Data Quality Check

We investigate the data quality, since potential systematic error could bias the results and prevent their generalization. We find that the dataset is of sufficient quality in order to generalize the results. We carry out two data quality checks. First, we randomly select 10 company-years from the initial dataset prior to any adjustments or data trimming and compare the accounting data for the fiscal year provided by DATASTREAM® to those provided by a company in the annual statement.[30] We compare the data on monthly closing prices returned by the DATASTREAM® to closing prices provided by Bloomberg. Second, we randomly select 10 company-years from the final dataset after applying the data requirement criteria, creating earnings stability measure and deleting outliers and proceed identically.

10 company-years from the first data check consisted of companies from 8 countries and varied from 1998 to 2014. In 5 cases the data on Sales and Total Assets figure are marginally different, this is likely to be caused by a different methodology of reporting.[31] The data on the fiscal year end and the monthly closing price are correct in all cases. In 1 case the EPS figure returned by the DATASTREAM® is significantly distorted, however, this is due to a correct stock split recognition. Disturbingly, we find 2 cases of aggregate earnings figure with 1% and 4% earnings overstatement. Similar misstatements are likely to introduce noise into our analysis by distorting the valuation multiples, we attempt to address this concern by cautious treatment of outlying observations.

The 10 company-years from the second data check consisted of companies from 7 countries and varied from 1995 to 2013. Overall the data quality of the processed dataset is significantly better, with no differences in prices, fiscal year end dates or Net Profit figure, however, with three cases of marginal difference in Sales and Total Assets figure and one case of EPS misstatement. This is, again, due to a correct recognition of a stock split.

Jointly the results of these quality checks serve as a demonstration of a possible data quality issue in some variables and emphasize necessary prudence during the analysis as well as a need for a cautious outlier treatment process. However, we claim that regardless of these marginal differences this dataset provides data of sufficient quality.

Robustness Checks

We conduct robustness checks to ensure that we appropriately operationalize the construct of company stability and find that our empirical results are robust against all conducted robustness checks. For the purpose of robustness check we specify the stability measure as a 5-year rolling standard deviation of the inverse hyperbolic sine of (1) Return on Equity[32] (2) Earnings per Share (3) Cash Flows from Operations and (4) Return on Sales. We extend the window for standard deviation calculation from 5 to 7 years for all stability specifications. Importantly, the results of the valuation analysis are robust and show significant improvements in the valuation accuracy and precision for all stability specifications for both, PE and PBV,

[30] In case the company's annual statement is not available we use databases of different data providers such as Bloomberg® or Morningstar® for comparison.

[31] For instance, Thomson Reuters DATASTREAM® reports Net Revenue instead of Sales figure. The specification of this figure is different for financial sector. Therefore, we exclude these companies from supplementary analyses if Sales figure is used.

[32] While EPS conveys essentially the same information on a deflated basis and fits the definition of absolute value creation, ROE delivers the information in form of ratio that can be influenced by eventual equity offerings. Besides the potential of ROE being influenced by seasoned equity offerings, the stability measure based on ROE captures the notion of stability from a relative perspective and no longer represents our definition of absolute earnings stream. This results in slightly different outcomes. Because of this fact, we provide empirical results for this robustness check along with the results for the base-case stability measure.

valuation techniques. On the other hand, in some cases the regression results are unfavourable. The general linear hypothesis that the earnings coefficient from the regression (8) equals 1 is not met for company fixed effects panel regressions by any alternative specification. Hereby, we briefly describe the untabulated regression and empirical results for different stability measure constructions.

From the regression results obtained for robustness checks we conclude that different stability measure specifications result in favourable regression outcomes for between company effects and annual cross sectional regressions in the case of the most stable companies. However, in order to meet the general linear hypothesis of earnings coefficient being equal to 1 we have to widen the confidence intervals by using 99% confidence level instead of 95%.

On the other hand, the general linear hypothesis is rejected for all stability measure specifications in the case of company fixed effects regressions. In the case of company fixed effects regressions the stability measure constructed on the aggregate earnings, the base case, is the only stability specification for which the general linear hypothesis is met.

From the valuation analysis results we find that any of the proposed stability measure specifications result in significant improvement of between company PE and PBV valuation technique's accuracy and precision. This improvement is significant on a 0.1% level for the most stable companies as well as for the average company. The peer selection *Method 1* for which the stability measure is constructed using the aggregate earnings, the base case, dominates all other valuation techniques for all alternative stability measure specifications for the first 5 stability decile groups. Surprisingly, the mean absolute valuation error for the average company from the *final sample* is lowest in the case of PE valuation technique using the peer selection *Method 1* where the stability measure is constructed on the basis of ROE.

Price-to-Book Value (complementary hypothesis)

Besides the argument of PE ratio stability, one can easily derive an argument for Price to Book Value ratio stability by introducing the same set of assumptions. Firstly, we divide both sides of the residual income formula by the beginning Book Value of Equity.

$$\frac{MV_t}{BV} = 1 + \sum_{t=1}^{\infty} \frac{ROE_t - r_t}{(1 + r_t)^t} \tag{12}$$

Then, we apply the assumption of stable cost of equity in order to be able to utilize the perpetuity valuation formula. Since Residual Income formula (12) allows for Return on Equity (ROE) variability it is necessary to introduce a factor of ROE stability. This can be done in 2 ways. Either by assuming stable earnings in conjunction with constant Book Value of Equity, or by directly assuming ROE stability. [33] As a result of these assumptions and by applying perpetuity valuation, we infer stability of the Price to Book Value ratio for companies with stable earnings stream.

$$\frac{MV_t}{BV_t} = \frac{ROE}{r} \tag{13}$$

Building on the argument of PBV multiple stability for stable companies (13) we express a complementary hypothesis that the indirect multiple valuation method in form of Price to Book Value multiple, yields lower valuation error for companies with stable earnings stream.

[33] We argue above that for companies with stable earnings Book Value of Equity is likely to approximate stability as well. We tabulate results based on this reasoning.

Lastly, we claim that selecting peers based on their relative stability arguably decreases the resulting valuation error, not only for the most stable companies but throughout the whole sample. We argue that the potential increase in multiple valuation accuracy has its roots in fact that relative earnings stability measure captures many idiosyncratic features of companies even after controlling for industry and country specification. While finance literature identified product longevity, industry barriers to entry, market value of company etc. as factors behind earnings stability (Lev, 1983). We claim that besides these identified factors there are many factors whose effect on earnings stability has not been subject to empirical test yet, for instance corporate governance, managerial style and job security of managers, geographical diversification of operations and many others.[34] Consequently, we acknowledge that the interaction of many identified and unidentified factors results in earnings stability. Therefore, we hypothesize that controlling for relative earnings stability in peer selection process results in valuation accuracy increase due to shared characteristics between the valued and peer companies.

[34] Arguably, by applying the same logic as Lev (1983) on the product diversification, one can claim that companies that are more geographically diversified have less variable earnings stream. Following Bamber et al. (2010), the more uncertain the managers are about their job within the company, the less likely they are to make choices threatening their position, such as committing aggressive earnings management. On contrary, such managers are more likely to smooth earnings, which results in more stable earnings stream that is preferred by stockholders. By applying the Prospect Theory (Kahneman & Tversky, 1979), we assume that companies with stronger stockholders' position are more likely to engage in conservative earnings smoothing than companies with stronger managerial position.

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