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The Equity Valuation Accuracy among Multiple Screening Models: A Study from an Emerging Stock Market

Rayenda Khresna Brahmana and Chee-Wooi Hooy
School of Management, University of Science Malaysia, 11800 Minden, P. Penang, Malaysia

Abstract: Over the past 3 decades, none of valuation models is accepted as the most accurate valuation model. The most common debate in academic area is about Discounted Cash Flow (DCF) and Residual Income Valuation (RIV). Multiple screenings, a valuation model that common for practitioners are seldom investigated. This research conducted a test to investigate the best multiple screening models in term of valuation accuracy. Hypothetically, multiple screening models are classified into Price Earnings Ratio (PER) approach, Price to Sales Ratio (PSR) and Price to Book Value (PBV) ratio. After conducting the investigation in pooled data, PER method is superior in term of valuation accuracy compare to PSR and PBV. In industrial classification, PBV outperform the accuracy of PER and PSR approach in 17 industrial categories. Meanwhile PER which outstanding in accuracy of pooled data is only superior in 10 industrial categories. Thus, PER method still can be used in those 17 PBV industrial categories because of the small differences. But, PBV cannot be used as valuation method in 3 industrial categories. This research still needs further discussion, especially, the discussion of using non-linear approach using forecasted value driver and using combination of value drivers.

Key words: Valuation accuracy, PER, PBV, PSR, Malaysia listed companies, DCF

INTRODUCTION

Over the past 3 decades, none of valuation models is accepted as the most accurate valuation model. This inaccuracy can be caused by many factors, such as: time frame of valuation (Pike *et al*., 1993; Ingibergsson, 2007), effect of revenue forecast (Sivaramakrishnan and Rees, 2001; Bradshaw, 2004; Loh and Mian, 2005; Ertimur and Stubben, 2005), effect of interest rate (Fruhwirth and Schwaiger, 2004; Gode and Ohlson, 2002), effect of cash flow (Fernandez, 2002; Barth *et al*., 2004; Ertimur and Stubben, 2005) and effect of high or low inflation (Ashton *et al*., 2007; O'Hanlon and Peasnell, 2002). The most common debate of valuation accuracy in academic area is between Discounted Cash Flow (DCF) and Residual Income Valuation (RIV). Multiple screenings (hereafter, MS), a valuation model that common for practitioners are seldom investigated because of its errors in appraising fundamental value (Pereiro, 2001). MS is widely practiced technique. It is very popular because of its simplicity concept. Unlike DCF and RIV, MS does not require cost of capital and multi-period forecasted financial data. Thus, MS has problem in differences of relative company's value. It makes practitioner hardly to know which MS model is the best accurate model. There are three common models of MS which are Price Earnings Ratio (PER), Price to Book Value (PBV) and Price to Sales Ratio (PSR). Even though, there is remarkable practitioner interest in the best accuracy among MS models, the valuation accuracy in multiple screening is rarely investigated. Analyst does not notice which model of multiple screening is the best in evaluating the stock of emerging market. According to all these conditions, this study addresses the following question which multiple screening model is the best valuation model in term of accuracy? This study is important for practitioner, especially equity analyst. This study can assist equity analyst and (also) global portfolio manager in evaluating the stock from emerging markets as it will deliver the best multiple screening models that can be used for valuation. This study also contributes to body of knowledge, especially portfolio management and securities analysis. It delivers the best model of securities valuation in term of accuracy. It also delivers the suitable model to be employed in emerging markets such as Malaysia.

Literature review: Academic research about valuation focuses on DCF and RIV model. Research about multiple screening, especially measuring the valuation accuracy in emerging market is very rare. In other hand because of time constraints, analyst usually conducts multiple screening and rarely uses DCF or RIV. Therefore, there is

Corresponding Author: Rayenda Khresna Brahmana, School of Management, University of Science Malaysia, 11800 Minden, P. Penang, Malaysia

a gap between academician and practitioners. This study aims to bridge the gap by delivering the best model of multiple screening in term of accuracy. Further, valuation accuracy is a new topic in finance as the contrary result of market efficiency theory. Valuation accuracy can be defined as the ability of a valuation model to correctly identify the subsequent transacted market price (Crosby, 2000).

As additional, valuation accuracy can be considered as the proximity of valuation to market price (Parker, 1999). Alford (1992) surmised that in the simple multiple valuation, after controlling for industrial membership, further control in firm size, earnings growth and leverage do not reduce the valuation errors. Kim and Ritter (1999) and Liu *et al.* (2002) suggest that using the forward earnings multiple yields higher valuation accuracy compared to using any historical multiples. Bhojraj and Lee (2002) present a general approach to select comparable firms for the simple multiple valuations using the stock price multiple to sales or book value of equity. They address that using sales or book value in stock price multiple can reduce the valuation errors.

Further, they also suggested that improvement in valuation accuracy can be achieved by using industrial and size matches technique. Kaplan and Ruback (1995) address that in the context of management buyouts, Capital Asset Pricing Model (CAPM) based Discounted Cash Flows (DCF) valuation approach has approximately the same valuation accuracy as a simple multiple valuation using cash flows multiple. Meanwhile Ohlson (1995) argues that residual income valuation model is accurate enough to be used. Current research of valuation accuracy is conducted by Yoo (2006). He/She addresses interesting result of the accuracy of PER and combining PER. Yoo investigates the accuracy of the combination of several simple multiple screenings in order to the improve valuation accuracy. He/She addresses that simple multiple screenings is accurate enough in evaluating the securities.

Different with other research, Beatty *et al.* (1999) examine different linear combination of the multiple valuations based on historical earnings, book value, dividends and total assets. They found that the highest valuation accuracy is achieved by using weight derived from price-deflated regression on historical earnings. In the end, the compilation of literature review shows that there are no consensus of which model is the best model in valuation in term of accuracy. Moreover, the literature shows that most of the research on valuation accuracy conducted in developed markets. In this study, the historical earnings multiples are considered for equity valuation of broader firms rather than Liu *et al.* (2002) forward earnings multiples. According to Yoo (2006), the historical earnings multiple provides more robust information in eliminating valuation errors.

MATERIALS AND METHODS

The multiple screening models that conducted in this research are the conventional multiple screening. It uses value drivers as the inputs of valuation. The latter, multiple screening models will be conducted first before determining the percentage valuation errors. Percentage valuation errors are extracted from the differences between intrinsic value and market value. This value is the base for valuation accuracy.

Multiple screening valuation: The models are constructed by theoretical model that can be found in Penman (2007) and Pereiro (2006). These models are also used by Liu *et al.* (2002) and Yoo (2006). The multiples models are:

$$PER = \frac{MV_t}{EPS_t} \quad (1)$$

$$PBV = \frac{MV_t}{BV_t} \quad (2)$$

$$PSR = \frac{MV_t}{Sales_t} \quad (3)$$

Where:

PER = Price Earnings Ratio
EPS_t = Earnings Per Share at time t
PBV = Price to Book Value
BV_t = Book Value at time t
PSR = Price to Sales
$Sales_t$ = Sales at time t
MV_t = Market Value at time t

After finding the PER, PBV and PSR, this research found the average of those multipliers. The multipliers will be converted into intrinsic value as follows:

$$EIV_{it} = \overline{MS_{IA}} \, x X_{it} \quad (4)$$

Where:

EIV_{it} = Estimated Intrinsic Value of firm (i) in time t
MS_{IA} = The average multiple screenings (PER, PBV, PSR) of industrial
X_{it} = The corresponding value driver (EPS, BV, Sales) of firm (i) in time t

This study used 3 main value drivers which are EPS, Sales and Book Value of equity. According to Penman

(2007) to find the current intrinsic value, the value drivers were extracted from historical accounting data. The study extracted the historical accounting data from Thomson data stream. We used Thomson data stream to classify the industry as the criterion for identifying comparables firms that have risks and growth similar to those of valued firms. After classifying the comparable firms from the same industry, the next procedure is estimating the intrinsic value by using mentioned formula. This is consistent with the common use multiple screenings procedure in Liu *et al.* (2002), Pereiro (2002), Penman (2007) and Yoo (2006). To make it more robust, this study impose the percentage valuation errors are restricted to the zero harmonic mean. This is consistent with Liu *et al.* (2002) who also used harmonic mean as the restriction. This restriction will maintain consistency and not-bias-information in econometrics models.

Statistical tools: The study will conduct three statistics simultaneously. Each of statistical tools measures the magnitude of the valuation errors in different ways. The statistics that will be used are:

- Mean of Absolute Valuation Errors (MAVE)
- Inter-Quartile Range of Valuation Errors (IQVRE)
- Absoluter Percentage Valuation Errors (AVE) which has to be over 15%

Then, the study will conduct significance test of the differences by t-statistics.

Sample: The sample in this research is all companies that listed in Bursa Malaysia. Bursa Malaysia is a good proxy of emerging markets in 3 ways. Firstly, it has growth relatively fast recently. Secondly, it has relative better market microstructure compare to other emerging markets. The market microstructure is important as it will influence the efficiency and liquidity of the market. Lastly, Bursa Malaysia provides relatively much longer time series data compare to other emerging markets. This is important as the more the data, the more robust is the research. There are 947 companies which retrieved from Thompson data stream. To extract the reliable data, this research follows Liu *et al.* (2002) and Yoo (2006). To be reliable sample, the firm has to satisfy the following criteria:

- Stock prices, actual earnings and number of shares are available from Thomson data stream
- Financial statement data needed to calculate multiples (book value, sales and EPS) are available from Thomson data stream
- Company has to have those data in complete from January 2001 until December 2008
- To have best comparison, company has to have cluster based industrial type that classified by Thomson data stream
- All valuation multiples have to be positive (>0 or equal to 0). This is important as negative result indicates loser stock or erroneous valuation

Table 1: Descriptive statistic result

Parameters	Mean	SD	Median	Skewness
MP	2.037222	3.335571	1.280667	8.482207
PER	2.499967	8.431184	1.413250	38.608460
PBV	4.974231	9.891817	1.914258	5.202865
PSR	6.719480	19.313090	1.906450	9.032887

MP is the market value of equity, PER is the intrinsic value result after conducted PER approach. Average of industrial PER multiply by forecasted EPS of firms in the industry. PBV is the intrinsic value result after conducted PBV approach. Average of industrial PBV multiply by forecasted BV of firms in the industry. PSR is the intrinsic value result after conducted PSR approach. Average of industrial PSR multiply by forecasted sales of firms in the industry

The resulting sample which has 2, 800 observations of 349 firms between 2001 and 2008 is used for the descriptive statistics shown in Table 1. The Table imposes; all valuation multiples screening result are positive; firm year is all in 2001 up to 2008. As shown in Table 1, the descriptive results of the value drivers are consistent with prior research (Liu *et al.*, 2002; Yoo, 2006). Table 1 shows the distribution of market value and intrinsic value which calculated by MS models. This result means from 947 firms that listed in Bursa Malaysia, only 349 firms used as samples. The rationalizations are: to ensure the comparable groups are not unreasonably small and to avoid the negative valuation outcome.

RESULTS AND DISCUSSION

Descriptive results: As same as prior research (Liu *et al.*, 2002; Yoo, 2006), the descriptive result addresses the ratio of intrinsic value to market value and the pair-wise correlation of multiple screening outcomes. The corresponding value drivers are taken from the frequent used model. Practically, these three value drivers (PER, PBV, PSR) are common used MS (Yoo, 2006). These three value drivers are also common used value drivers in academic research (Liu *et al.*, 2002; Fernandez, 2003; Penman, 2007; Yoo, 2006). The chosen three, representative value drivers are as follows:

- EPS
- Book value
- Sales

Table 2 shows the correlation between valuation results of MS. It indicates that the valuation results of MS are positively correlated each others, signifying that all methods of MS share substantial common information. Table 3 shows 3 important findings which are: first, the medians of the valuation errors are negative. This is a contrary result with Liu *et al.* (2002) and Yoo (2006). This inconsistency addresses that not like in US, Malaysia single stock price is underpricing. Second, the means of valuation errors are almost vary. Only PER method has close result to zero. This is also a contrary result with Liu *et al.* (2002) and Yoo (2006). If the means of valuation errors close to zero, it means that the method is an unbiased estimator of intrinsic value. This research result showed that only PER method can be used as the robust intrinsic value. Third, the PER method which driven by projected EPS has the highest level of accuracy in term of means of valuation errors. Meanwhile, PSR method is the worst method to be use among multiple screenings. This result is consistent with Liu *et al.* (2002) and Yoo (2006) results.

Valuation accuracy of multiple screening method in pooled data: This study discusses two main analyses: Analysis of valuation accuracy in pooled data which means examines the valuation accuracy of multiple screening models by single stock prices and analysis of valuation accuracy in industrial classification which means examine the valuation accuracy of multiple screening models of its industrial classification. The industrial classification intrinsic value is taken by averaging the single stock intrinsic value which under the same industrial classification. As mentioned earlier, the classification follow Thomson data stream classification. Liu *et al.* (2002) and Yoo (2006) stated the simple valuation using historical drivers of EBITDA (or EPS) which addressed by PER model has better accuracy rather than other value drivers (Sales and Book Value). Based on the explanation above, the first hypothesis of the study is:

H_{01}: Among multiple screening methods, PER approach has the most accurate result in pooled data

Table 3 shows the distribution of percentage errors. It means the table showed us the valuation errors accuracy of multiple screening models. Table 4 shows the t-statistics for testing the additional information lying in hypothesis. As shown in Table 3, the valuation errors of MS model are significantly different each others. Table 4 confirms by showing the valuation errors measure are statistically significant. This result suggests each value drivers does not capture the information that contained in each models. Those tables also reported

Table 2: Correlation among valuation model results of MS

	PVE PER	PVE PSR	PVE PBV
PVE PER	-	0.044	0.015
PVE PSR	0.124	-	0.127
PVE PBV	0.093	0.235	-

The upper triangle reveals the pearson correlation and the lower triangle reflects the spearman correlation

Table 3: The MAVE, AVE, IQRVE, mean and media result of valuation model percentage valuation errors

Parameters	MAVE	15% AVE	IQRVE	Mean	Median
PVE PER	1.558665	1.790665	1.259513	-0.46229	-0.07766
PVE PBV	2.022369	2.976008	2.869008	-2.93668	-0.38207
PVE PSR	1.828176	2.162176	1.747228	-4.68350	-0.54300

The Percentage Valuation Errors (PVE) are defined by the actual stock prices minus the estimated equity values deflated by stock prices. PVE PER is the percentage valuation errors of the simple multiple valuation using the PER approach. PVE PBV is the percentage valuation errors of the simple multiple valuations using the PBV approach. PVE PSR is the percentage valuation errors of the simple multiple valuations using the PSR approach

Table 4: Valuation errors of MS models

	MAVE	
Parameters	PVE PER	PVE PSR
PVE PER	-	3.006
PVE PSR	3.006	-
PVE PBV	3.951	5.903

Table 4 is t-statisitc for the valuation errors comparison between MS models. PVE stands for percentage valuation errors

that it is important to find the new model of MS to reduce the errors. As mentioned above, Table 3 and 4 showed the valuation errors of MS model are still significantly large. Thus among the simple MS models, PER approach have more robust information and superior in term of valuation accuracy in pooled data.

Figure 1 shows the vivid scatter diagram of the dispersion of the differences between intrinsic value and market value. In other words, it showed the valuation errors accuracy of all multiple screenings. If a MS model has more distribution in-line with the trend of normal quartile, it can be considered as a superior valuation method in terms of valuation accuracy. If the result of a MS model disperses away from the trend, it means the model is not accurate.

So, more it is away from the mean trend line, more inaccurate the result of the valuation model. As showed by Fig. 1, the PER model presents more close-point to the normal quartile than PSR and PBV models. In other words, PER model has more in-line distribution than other MS methods. It can be concluded, PER model is more superior in term of valuation accuracy compare to PSR and PBV method.

This result is aligned with the result of statistical test. It is confirmed by the skewness and kurtosis of the percentage of valuation errors. The skewness of percentage errors addresses the asymmetry of probability distribution. PER and PBV models have negative skew. It means the percentage errors have few low values.

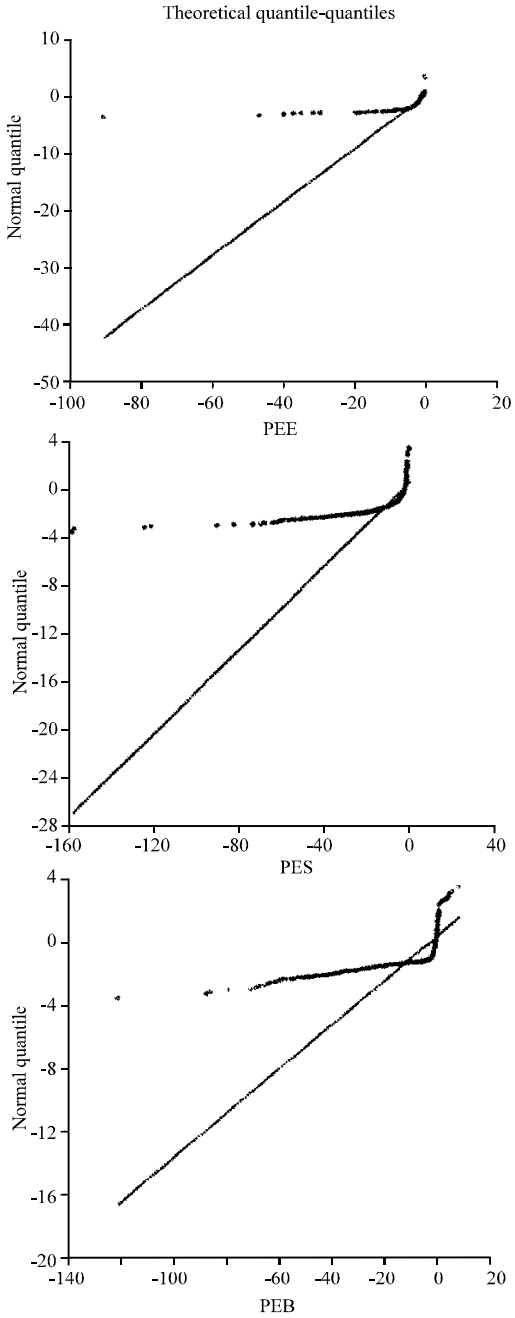

Fig. 1: Normal distribution of each MS models

Meanwhile, PSR model has positive skew. It means the percentage errors have few high values. Thus, PER model result has more relatively normal distributed percentage errors compare to PSR and PBV models. It can be concluded, PER model is superior in term of valuation accuracy than PSR and PBV models. The kurtosis addresses the peakness distribution of percentage errors. Peakness distribution means the accuracy of valuation. PER model result presents more peaked distribution than PSR and PBV models. It means in term of peaked distribution which shown by kurtosis, PER model is superior in term of valuation accuracy than PSR and PBV models.

Result of skewness and kurtosis confirm the explanation of Fig. 1 where PER model is the best model of MS in term of valuation accuracy. Next as the robustness check, the study examines the accuracy in an industry separately rather than pooled data. This analysis is conducted to check the accuracy of each MS models in an industry. It also investigates the consistency of pooled data result in term of superiority in valuation accuracy.

Valuation accuracy of multiple screening method in industrial classification data: This study will describe the analysis of valuation accuracy in industry classification data. It is important to investigate the performance of multiple screenings in term valuation accuracy based on Industrial classification. This study is the robustness cross check about the consistency of pooled date result. Based on Liu *et al.* (2002 and Yoo (2006) the hypothesis is:

H_{02}: Among multiple screening methods, PER approach has the most accurate result in industrial classification data

Table 5 shows the accuracy proxy of multiple screening methods which are:

- Mean of percentage errors
- Median of percentage errors
- The standard deviation
- Mean absolute of valuation errors

First, Mean of Percentage Errors (MPE) and Mean Absolute of Valuation Errors (MAVE) are the robust method to measure valuation accuracy. This method derived from Liu *et al.* (2002) and Yoo (2006). The result of MPE and MAVE showed interesting result. By industrial classification, the accuracy of PBV result outperform the accuracy of PER and PSR models in 17 industry categories.

PER model which is the most accurate models in pooled data only beat the accuracy of PSR and PBV models in 10 industry categories which are: Banks, Pulp and Study, Gas-Water-Multi utilities, Leisure, Oil-Gas-Production, Pharmacy, Real Estate, Support Industry and Travels. Further, PSR model has the best accuracy in 3 industry categories which are general industry, media and software. In conclusion, in terms of valuation accuracy, PBV model can be used in more industrial classifications rather than PER and PSR model.

Table 5: The Mean, Median, SD and Mave of industrial classification data

	Mean			Median			SD			MAVE		
Industries	PER	PSR	PBV	PER	PSR	PBV	PER	PSR	PBV	PER	PSR	PBV
AUTO	0.859	11.521	0.158	0.693	11.536	0.172	0.710	2.179	0.339	0.569	1.625	0.278
BANK	-3.419	2.560	4.322	-3.330	1.273	-0.323	0.930	2.871	8.634	0.605	2.063	6.904
BVRG	0.098	0.232	-0.074	-0.007	0.293	-0.067	1.640	0.979	0.153	0.917	0.559	0.111
CHEM	0.661	0.938	-0.071	0.708	0.904	-0.095	0.378	0.227	0.262	0.280	0.174	0.183
ICONS	1.282	2.186	1.147	0.321	1.582	0.369	3.846	2.308	1.738	2.311	1.521	1.177
ELEC	0.689	0.801	0.595	0.765	0.852	0.643	0.649	0.247	0.289	0.492	0.193	0.208
ECTY	-1.130	12.432	-0.581	-1.127	11.620	-0.537	0.539	4.012	0.250	0.387	2.630	0.192
INVS	0.829	21.120	0.385	0.782	20.761	0.371	0.917	3.130	0.271	0.620	2.564	0.212
FPRD	0.331	2.681	0.026	0.315	2.949	0.027	0.448	1.016	0.116	0.308	0.852	0.093
PNPR	0.896	4.661	0.904	0.292	4.975	0.861	1.483	1.907	0.509	1.157	1.625	0.388
GWMI	0.269	2.722	0.571	0.330	2.415	0.582	0.386	1.735	0.375	0.300	1.397	0.298
GIND	0.109	-0.003	0.295	0.025	0.014	0.366	0.493	0.171	0.233	0.347	0.129	0.172
GRET	0.198	0.130	0.014	0.233	0.161	-0.075	0.412	0.311	0.320	0.304	0.173	0.204
HECA	0.434	0.708	0.095	0.338	0.751	0.106	0.546	0.115	0.137	0.447	0.093	0.096
HHGH	0.164	0.802	0.096	0.117	0.778	0.117	0.320	0.318	0.234	0.282	0.246	0.182
INEN	0.577	1.659	0.110	-0.031	0.662	0.213	1.861	2.450	0.387	1.277	1.693	0.318
IMMI	0.053	0.225	0.129	-0.005	0.264	0.142	0.373	0.726	0.288	0.287	0.418	0.231
TRAN	1.333	1.115	0.203	0.648	1.218	0.118	1.503	0.371	0.471	1.197	0.309	0.358
LEIS	0.164	2.380	0.341	0.241	2.208	0.197	0.706	0.794	0.523	0.532	0.605	0.412
ILINS	1.386	2.638	-0.214	0.935	2.037	-0.341	2.624	1.355	0.405	1.623	1.030	0.304
MEDI	0.204	0.192	0.591	0.070	0.257	0.200	0.497	0.217	0.778	0.348	0.132	0.648
OIGA	0.224	0.523	-0.236	-0.385	0.493	-0.117	1.325	0.190	0.647	1.047	0.135	0.413
PGOD	0.238	0.861	0.084	-0.100	0.272	0.086	1.212	1.697	0.287	0.926	1.045	0.186
PHBI	0.386	3.358	23.489	0.410	0.935	22.575	0.451	4.024	4.265	0.369	3.286	2.852
REST	0.199	3.741	0.141	0.288	3.666	0.088	0.660	0.387	0.237	0.409	0.294	0.181
SWAR	0.150	0.041	-2.129	0.078	0.377	-1.573	2.050	1.165	1.906	1.207	0.711	1.390
SUPP	-0.003	6.500	-0.254	-0.288	5.376	0.114	3.258	3.814	0.813	2.283	3.090	0.645
TECH	-1.099	-4.020	0.460	-1.107	-3.958	-1.252	3.391	0.794	3.961	2.637	0.635	3.002
TOBA	0.770	4.556	-0.058	0.216	4.641	-0.018	1.284	1.024	0.561	1.024	0.783	0.337
TRAV	0.458	1.755	0.682	0.610	1.697	0.645	0.377	0.439	0.391	0.323	0.361	0.289

Mean is the mean of percentage valuation errors. Median is the median of the percentage of valuation errors. SD is the standard deviation of percentage valuation errors. MAVE is the mean absolute of valuation errors. Auto stands for automobile industry. Bank stands for banking industry. BVRG stands for beverage industry. CHEM stands for chemical industry. ICON stands for construction industry. ELEC stands for Electronic industry. ECTY stands for electricity industry. INVS stands for investment industry. FPRD stands for food production industry. PNPR stands for pulp and paper industry. GWMI stands for gas water and multi utilities industry. GIND stands for general industry. GRET stands for general retail industry. HECA stands for health care industry. HHGH stands for house hold good industry. INEN stands for industrial engineering. IMMI stands for mineral and mining industry. TRAN stands for transportation industry. LEIS stands for leisure industry. ILINS stands for insurance Industry. MEDI stands for media industry. OIGA stands for oil and gas industry. PGOD stands for personal goods industry. PHBI stands for pharmacy biotechnology industry. REST stands for real estate industry. SWAR stands for soft ware industry. SUPP stands for support industry. TECH stands for technology industry. TOBA stands for tobacco industry. TRAV stands for travel industry

Second, regarding to median of percentage errors as already discussed earlier, the positive median of percentage errors lead to the overpricing of the industrial classification prices. Table 5 showed all multiple screening models dominated by positive median of percentage errors. Only few industrial categories outcome are in negative median of percentage errors. This is consistent with Liu *et al*. (2002) and Yoo (2006) result. It also means all multiple screening methods has the same direction and contain the same information. These methods of multiple screening describe that by industrial classification there is extreme negative valuation error which mean Malaysia single stock prices are overpricing.

Third, the study found very interesting result. In pooled data, PER outperforms PSR and PBV as the most accurate model. Interestingly in industrial classification data, PER only pound the accuracy of PSR and PBV in 10 industry categories. Meanwhile, PBV outperforms the accuracy of PER and PSR in 17 industry categories. Table 5 shows that PBV model result outperform the accuracy of PER model result in industrial classification data. Meanwhile in pooled data, PER model result outperform the accuracy of PBV and PSR model. The explanation of the PER becomes the best model in pooled data is: PBV has a very bad accuracy in three industries. Meanwhile, PER even though can not beat the accuracy of PBV result in 17 industry categories, has close result to PBV. Not like PBV model, there are no extreme results of accuracy in PER model. As the result for Industrial Classification data, PER method is still the most accurate model among multiple screening models. It means the result support the null hypothesis stating among multiple screening methods, PER approach has the most accurate result in Industrial Classification Data.

Summation of multiple screening models accuracy: From the analyses above, it can be summarize in two important findings. First in pooled data, Price Earnings Ratio (PER) has the best accuracy compare to other multiple screening methods. EPS contain more information as value drivers

rather than Sales and Book Value. This is consistent with Liu *et al.* (2002) and Yoo (2006). Second in industrial classification data, PER only can beat PBV and PSR result in 10 industry categories. Meanwhile PBV is the superior method in term of valuation accuracy in 17 industry categories. Even though, PBV accuracy outperform PER accuracy, the differences between PER percentage errors and PBV percentage errors are small. In other hand, PBV outcome is very bad in 3 industry categories. This situation explains why in pooled data PER is a superior model compare to PBV.

CONCLUSION

This study examines the accuracy of multiple screening models. This study aims to address which multiple approaches are best in term of accuracy. By investigating the percentage errors of intrinsic value which derived from PER, PSR and PBV this research wants to examine the valuation accuracy.

The result that shown by this research is PER approach is superior method in term of valuation accuracy in pooled data. The MAVE, Mean, Median, KURTOSIS, SKEWNESS, IQRVE, T-STATISTIC and graphs showed that PER is more reliable method among multiple screenings models. Further in Industrial classification, PER is only superior in 10 industry categories. Meanwhile, PBV is outperforming the valuation accuracy in 17 industry categories. Thus, the differences between PER and PBV in those 17 industry categories are small. In other hand, PBV run badly in 3 industry categories. PER is smoother in term of percentage valuation errors than PBV and PSR.

It can be concluded in pooled data, PER is the best valuation accuracy among multiple screening models. In Industrial classification, even though PBV outperform the accuracy in 17 categories, PER is still reliable to be use in stock valuation. This research is limited on linear approach of MS models. The non-linear approach may be able to improve the valuation accuracy. Further, comparing the historical value drivers and forecasted value drivers is also very important for next research. This possibility is still an open question.

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