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Equity Valuation Using Multiples: An Empirical Study on Plantation Sector

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EQUITY VALUATION USING MULTIPLES: AN EMPIRICAL STUDY ON PLANTATION SECTOR

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ABSTRACT

Despite the fact the multiple valuation method is widely use in practice, surprisingly there is few empirical research available. To my knowledge, this study is probably the first empirical investigation on valuation performance of multiples in plantation sector and emerging market in Asia. I found that when selecting comparable firms either using plantation sector membership or adopting return of equity as control factor in plantation sector, price-to-earnings multiple leads to best valuation performance. In contrast, price-to-sales multiple yields the worst valuation performance in both selection methods. Moreover, the method using return of equity as control factor in plantation sector outperforms the selection method based on plantation sector membership.

To my family

for their patience and support in this and all my endeavours

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1.0   INTRODUCTION

1.1   RELATIVE VALUATION

In general, academicians are seemed to favor Discount Cash Flow model (DCF), which based on the intrinsic value concept, over the multiples (or relative valuation) in corporate valuation. Having said that, multiples still has distinct advantages since it can be used to reflect market perception, to identify over-price or under-price securities and; require less information and make fewer assumptions than DCF model.

Damodaran (2006) explained that in Discounted Cash Flow (DCF) model, the intrinsic value of an asset is estimated from future expected cash flows and it is based upon our faith in making perfect analysis on the asset's fundamentals. Nevertheless, the actual stock (or enterprise) price may not reflect the intrinsic value persistently if the market continues to be miss-pricing certain group of assets. He explained relative valuation, on the other hand, is based upon the assumption that the market is correct on average although some firms may over (under)-value. His survey showed that relative valuation is a very popular tool in equity and enterprise valuation. Besides that, multiples is a more widely accepted approach compared to Discounted Cash Flow (DCF) model in valuing IPOs for young firms in U.S. since the future expected cash flows is difficult to be estimated correctly (Kim & Ritter 1999). Park and Lee (2003) also said that Japan analysts generally prefer relative valuation model than Discounted Cash Flow (DCF) model because it is easy to use.

It is true that multiple methods do not require comprehensive valuation as discounted cash flow model; however, multiples still relies on same principles and captures the effect of future cash flow and risk (Liu, Nissim & Thomas 2001). As a matter of fact, relative valuation renders almost sufficient valuation performance. One research indicated that the prediction accuracy of multiples based upon two selection methods for comparable firm (i.e. industry membership or similar transaction across industry) is almost as good as compressed adjusted present value method (DCF model) in 51 samples of highly leveraged transactions from 1983 to 1989 (Kaplan & Ruback 1995).

1.2   MOTIVATION

Although multiple valuation method is widely adopted in practice, some researchers think that multiples are difficult to be implemented correctly. Damodaran (2002, p. 20)

explained that using multiples for valuation is easy but practitioners tend to misuse it because analysts have to make subjective decision to select comparable firms. The issue becomes more problematic when the analyzed firm is unique in terms of business and; it has few revenue or negative earnings. Schreiner (2007, p. 4) also argued that using multiples in corporate valuation is difficult in practice because many practitioners do not have good knowledge about the key driver of multiples and they do not know which methodology is effective in choosing comparable firms. He further argued that many practitioners lack of understanding about the defectiveness of traditional multiple valuations model; and, even if they know it but they tend to ignore it.

It is surprising that few empirical studies are available and most of the literatures fail to provide comprehensive framework that can guide practitioners to use multiples effectively (Kim & Ritter 1999; Bhojraj & Lee 2001; Liu, Nissim & Thomas 2001; Lie & Lie 2002; Hermann & Richter 2003; Dittman & Weiner 2005); Schreiner & Spremann 2007). Lie and Lie (2002) also pointed out that previous research fail to reach a consensus on choosing suitable multiples benchmark. Given the importance of relative valuation in corporate valuation, I believe that it is an important gap to be addressed.

Nevertheless, there is an increasing trend on empirical research on studying the effectiveness of multiples with different methodologies. Most of the research, however, are concentrated in US and developed countries in Europe and Asia. That is, most of the empirical studies in this decade are devoted into US data (Cheng & McNamara 2000; Lie, Erik & Lie, Heidi J. 2002), equity markets in European developed countries (Herrmann & Richter 2003; Dittmann & Weiner 2005; Schreiner & Spremann 2007; Fidanza 2010) and Japanese stock market across industries (Park & Lee 2003). There is also similar research on developing country in Europe, which is Bucharest stock market (Mînjina 2009). Schreiner and Spremann (2007) recommended that future study on multiples can be extended to emerging markets to provide more empirical evidences to formulate a more comprehensive framework for multiples. As far as I know, it is likely that there is no similar research for emerging markets in Asia and plantation sector. In this thesis, I try to address this knowledge gap by empirically examining the valuation performance of multiples in plantation sector in Malaysia, which is one of the emerging markets in Asia.

1.3   RESEARCH QUESTIONS

Schreiner and Spremann (2007) explained that multiple is a ratio of market price variable to its value driver. The value driver[1] of equity multiple (i.e. the denominator) is regarded as significant factor that affects equity price (i.e. the numerator). In this context, each value driver affects the market price differently and it may be reflected in valuation errors of the multiples. That is to say we can rank the valuation performance of multiples based on valuation errors and the result can be used as a guideline in selecting appropriate multiples in an industry. For example, if the valuation errors of P/E are found to be greater than the one of P/S, it can be justified by the fact that the book value of equity is a more significant value driver of stock price. Hence, it is advisable to choose the multiple that has smallest valuation errors in the industry. The related result about value drivers may also be used as a reference for analysts to verify their justified fundamentals in Discount Cash Flow (DCF) model. According to before-mentioned arguments, research question 1 is established.

"When plantation industry membership (traditional approach) is used as selection method for comparable firms, which multiple (i.e. P/S, P/E, P/B, P/CF and P/TA) yields smallest valuation errors? In other words, which value driver has most significant impact on market equity value?"

One known difficulty of relative valuation in practice is that analysts have to make subjective judgment to select comparable firms, e.g. based on industry membership (Damodaran 2006). Researchers argued that using industry membership as control groups to represent fundamentals such as risk, growth rates and payout ratios across the firms is a viable method (Park & Lee 2003). Having said that, the impact that stem from shortcoming of traditional approach in selecting comparable firms should not be neglected due to the fact that firms have different profitability growth. In this context, return on equity (ROE) plays important role since the increased of ROE leads to higher growth rate and vice versa (Damodaran 2006, p. 132). That is, the expected growth rate in earnings is perceived as the product of return on equity and retention ratio. Therefore, it is perfectly possible that ROE is an effective control factor and this leads to next research question.

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[1] The value driver concept should not be confused with the fundamental driver for the market price (i.e. equity or entity value) that stated in discounted cash flow model.

"Will the selection method of comparable firms that based on combination of industry membership and ROE yields lower valuation errors for multiples than the one on the basis on traditional approach (i.e. industry membership)?"

Using ROE as control factor in selecting comparable firms in same industry may improve the valuation performance of multiples from theoretical perspective. However, it is still unclear that how this approach will contribute positive effect on each multiple. The research question 3 is established based on this concern.

"When combination of plantation industry membership and ROE is used as control factor for comparable firms, which multiple (i.e. P/S, P/E, P/B, P/CF and P/TA) yields smallest valuation errors? In other words, which value driver has most significant impact on market equity value?"

1.4   STUDY OBJECTIVES AND REPORT STRUCTURE

This thesis evaluates the valuation accuracy of five multiples (i.e. P/E, P/B, P/CF, P/S and P/TA) in the plantation sector in Malaysia from 2003 to 2009. This study renders significant insights into methodology framework of multiple valuation method. Moreover, this study aims to help investors to identify suitable multiples in plantation sector based on empirical evidence rather than hypothesized concepts. There are three research objectives in this thesis. First, this study uses median absolute errors and non-parametric test to examine the valuation accuracy for multiples based on the two types of comparable firms, which are industry membership and; combination of industry membership and ROE. Second, this study identifies the relative performance on valuation accuracy of these multiples in each type of comparable firms. Finally, the study evaluates which type of comparable firms yields better valuation accuracy in multiples.

The thesis is organized as follows: in the second section, the literature review is presented; following this, the details of methodologies and the research design are expounded; subsequently, the chosen plantation sector and dataset will be explained; and in the nextpart, it is devoted into empirical findings and discussion; at last, appropriate conclusions and future suggestions are presented.

2.0   LITERATURE REVIEW

The traditional approach in relative valuation uses industry membership as the basis on selecting comparable firms. Park and Lee (2003) investigated how to utilise four

multiples (i.e. P/E, P/B, P/S and P/CF) in the Japanese stock market based on traditional approach. They studied the valuation accuracy of four multiples in predicting the actual stock prices. It is found that price-to-book (P/B) multiple was the most accurate one in the studied period. On top of that, they simulated a test by constructing two portfolios (i.e. undervalued and overvalued) with zero-net investment strategy to identify which multiple can generate best returns. It turned out the price-to-sales multiple generated highest return in the whole sample period while price-to-earnings multiple only performed relatively well in bear market period.

However, researchers often encounter great difficulty in selecting the closest comparable firms by using traditional approach in relative valuation. Many researchers opted to have control factors in selecting comparable firm which it seems more effective than traditional approach (i.e. industry membership) from theoretical perspective. This argument is supported by empirical results from Hermann and Richter (2003), which they discovered that selecting comparable firms with traditional industry approach (i.e. SIC industry code as industry proxy) in US and Europe yield lower valuation accuracy compared to the method using control factors.

Alford (1992) also investigated various selection methods of comparable firms (i.e. market, industry, risk, ROE and combination of methods) for P/E multiple based on U.S. data in 1978, 1982 and 1986. It is found that using industry membership (i.e. up to 3-digit in SIC codes) and; combination of risk and earnings growth as the basis of selecting comparable firms perform better than other selection methods. Furthermore, the research showed that the valuation accuracy of P/E multiple improve when firm size increased. At last, it is found that selecting firms with similar risk or earnings growth rate (i.e. ROE as proxy) only slightly improve the valuation accuracy of P/E multiple.

Similarly, Cheng and McNamara (2000) assessed the valuation accuracy of multiples for P/E, P/B and a special multiple (i.e. P/E-P/B), which is a combination of P/E and P/B. They used the market, industry membership, size, ROE; combination of industry and size; and combination of industry and ROE as the basis to select benchmark multiples. The research showed that using combination of industry membership and ROE (IND-ROE) as benchmark yields best estimation for P/E and P/B multiples while P/E-P/B multiple performs the best when industry membership is used as the

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basis to select benchmark to evaluate unknown firm value. Lastly, the research found that the performance of P/E outdo P/B multiple which leads to conclusion that earnings is a more significant value driver for stock price.

Furthermore, Liu, Nissim and Thomas (2001) investigated the pricing accuracy of several multiples across industries to identify value driver that can affect market value of each multiple. They ranked the performance of multiples from best to worst in following order which are: trailing P/E, forward-looking P/E, P/CF, P/B and P/S. This result is very antithesis of general idea that arguing each industry has its own best multiples.

Another research from Lie and Lie (2002) showed the valuation accuracy of multiples changes in relation to factors such as firm size, profitability and level of intangible assets. It is found that multiples produce more accurate valuation for large firms. Moreover, the research indicated that asset multiple (i.e. Market Value-to-Book Value Asset) is a more accurate and less biased compared to sales and earnings multiples. At last, the valuation accuracy of EBITDA multiple is found better than EBIT multiple.

Dittman and Weiner (2005) also looked into five selection methods (i.e. market, industry, ROA, TA; and ROA and TA) to choose comparable firms for EV/EBIT multiple from three study groups which are from same country, same region and OECD members. The research showed that using return on assets as control factor in selecting comparable firms produces most accurate forecasts compared to methods using industry membership and total assets. On the other hand, the research found no obvious trend for the valuation errors in the sample period.

One recent investigation (Schreiner and Spremann 2007) on the valuation accuracy of multiples has been devoted into comprehensive European data. The research discovered several important findings in European equity markets as follows: first, equity value multiples perform better than entity value multiples; second, knowledge-related multiple outperform conventional multiples; third, the forward-looking multiples especially the two-year forward P/E multiples are more accurate than trailing multiples. Schreiner and Spremann (2007) claimed that the statistical findings in the research are robust, significant in magnitude and constant over the sample period from 1996 to 2005.

Most of the previous research mainly focuses on developed markets in US and Europe and the lack of empirical evidence from emerging markets started to catch researchers' attention. Mînjina (2009) conducted first comprehensive empirical study on valuation accuracy of multiples in the emerging market from Europe. He studied the valuation performance of seven multiples (i.e. P/E, P/B, P/CF, P/S, P/TA, EV/EBIT and EV/EBITDA) in Bucharest Stock Exchange. The research results showed that when using industry membership to select comparable firms, the P/CF multiple yields most accurate valuation compared to other multiples. Furthermore, the research indicated that if multiple valuation method adopts ROE as control factor to select comparable firms, P/E, P/B, P/CF and P/TA multiples will produce higher level of valuation accuracy compared to traditional approach (i.e. industry membership). In contrast, P/S multiple yields least accurate valuation when industry membership or ROE are used as the basis of selecting comparable firms.

3.0 METHODOLOGY

3.1 METHODOLOGY REVIEW

In general, using multiples valuation method involves two important processes. First, multiples have to be standardized to control size difference (i.e. price per share) before making comparison to its peers (Damodaran 2006, p.236). Second, analyst requires to select (or obtain) desired benchmark multiple prior to analysis. Arguably, selecting correct statistical estimator for benchmark multiples is very important to increase the reliability of valuation results. In the following part, I will present a review of selecting benchmark multiple and statistical estimators before developing the research design.

3.1.1 VARIOUS METHODS OF SELECTING BENCHMARK MULTIPLE

One popular approach in relative valuation is to associate the multiples with fundamental variables in DCF model such as risk, expected growth and cash flow generating capacity (Damodaran 2006). For example, analyst can combine Gordon Growth Model (GGM) and Dividend Discount Model (DDM) to estimate the market value of equity (i.e. *Stock Price = Expected Dividend / (Discount Rate - Growth Rate)*). Afterwards, analyst integrates estimated stock price with actual value of denominator (i.e. book value for P/E) to generate his own 'justified multiple'. Then,

analyst compared the 'justified multiple' with actual multiple to identify whether the current stock price is over- or undervalued. That is to say the 'justified multiple' becomes the benchmark multiple in relative valuation. However, this approach is exposed to similar weakness that existed in DCF model – which sensitive to assumptions (Damodaran 2006; Schreiner & Spremann 2007). Schreiner and Spremann (2007) also argued that using GGM to estimate the 'justified multiple' is a flaw approach since we explicitly assume 'justified multiple' is linearly proportional to the value driver (or denominator). For example, the 'justified P/E multiple' that based on Gordon Growth Model can be re-arranged to have linear relationship with M as follows:

$$Justified\frac{P}{E} = \frac{Expected\ Next\ Dividend}{Discount\ Rate - Growth\ Rate} x \frac{1}{Book\ Value\ of\ Equity}$$

$$Justified\frac{P}{E} = \frac{M}{Book\ Value\ of\ Equity}$$

Multiple linear regression technique is another plausible approach to estimate benchmark multiples. This technique examines relationship between the market variable of multiple (dependent variable) and fundamental based variables (independent variables) such as growth, payout ratio and risk (Bhojraj & Lee 2001; Damodaran 2006). The key advantage of regression is it examines the cross-sectional effect of fundamental variables; and it is based upon actual data. Having said that, Damodaran (2006) found that regression approach fails to produce reliable and accurate benchmark multiples since the intercept, coefficient of variables and R-square (i.e. explanatory power) in regression model fluctuated widely over time. He argued the noisy benchmark multiples may be attributed to the change of business cycle and regression shortcomings such as multi-collinearity issue and non-normally distributed samples. Similar empirical result is also discovered by Hermann and Richter (2003). They studied the effectiveness of various selection methods by using linear and non-linear regression models in which fundamental factors such as growth and ROE are used as independent variables. It turned out those valuation errors using benchmark multiples from regression technique is bigger than median absolute error (i.e. statistical estimator).

The third approach of selecting the benchmark multiple relies on theoretical concepts of multiples which assumes comparable firms have identical fundamentals such as

risk, growth and cash flow generating capacity; and hence same size of multiple is produced (Damodaran 2006; Schreiner & Spremann 2007) within certain period (Schreiner & Spremann 2007). Traditionally, analysts use subjective judgments to choose and calculate the average of multiples from the comparable firms. Then, analysts compare the average value of multiple with actual multiples of firm.

I agree that assumptions of comparable firms that have identical fundamentals are unlikely to be true in practice. However, I think the cross-sectional effect of fundamentals in a set of comparable firms will become closer if the selection method of comparable firms is improved. For instance, if comparable firms based on method 'A' have closer fundamentals, on aggregate, compared to industry, we can say the average of multiple based on method 'A' is better reflecting the cross-sectional effect of fundamentals than industry multiples.

3.1.2 CHOOSING STATISTICAL ESTIMATOR FOR BENCHMARK MULTIPLE

In general, researchers favor two statistical estimators to calculate the benchmark (or synthetic) multiple, which are median and harmonic mean. Arithmetic mean is ruled out because it may lead to overestimated value if multiple distributions are asymmetric or skewed (Hermann &Richter 2003).

Some researchers (Alford 1992; Cheng & McNamara 2000; Lie & Lie 2002; Park & Lee 2003; Schreiner & Spremann 2007) favored median as statistical estimator for synthetic multiple. Alford (1992) argued the key advantage of using median is it helps to mitigate outlier effect that ascribe to extreme multiples. Research from Lie and Lie (2002) support this argument. They found that medians do not produce biased estimation for all samples while arithmetic means is affected by extreme outlier effect in valuation performance of multiples.

Harmonic means is also a preferable statistical estimator to calculate the synthetic multiple of comparable firms since previous empirical research (Baker & Ruback, 1999; Liu, Nissim & Thomas 2001) showed that harmonic mean produces best performance valuation for multiples. One similarity in previous research is that the outlier effect of multiples is mitigated in the study. This motivates researcher (Mînjina 2009) to remove the extreme multiples' value that below 1 percentile or greater 99

percentile of the multiple distributions in studying the valuation performance of multiples. However, this exclusion of extreme multiples signifies the newly improved data may cause a bias in the study and pose a threat to reliability and credibility of the result.

Indeed, Liu, Nissim and Thomas (2001) also found that valuation errors are smaller when using harmonic mean for multiples compared to arithmetic mean and median. However, they explained that valuation errors in their study are skewed to the left; thereby the arithmetic mean is smaller than median. Based on this observation, I argue that harmonic means is probably a better statistical estimator for synthetic multiple in left-skewed valuation error distribution. Furthermore, some studies found no evidence that harmonic means is the best statistical estimator for synthetic multiple. For example, Hermann and Richter (2003), who investigated selection methods of comparable firms, found that harmonic mean is the worst estimator while median is the most accurate estimator in heterogeneous samples. In the study, they did not eliminate the outlier effect. In short, I believe that the harmonic mean is likely a better statistical estimator for synthetic multiple when following conditions are fulfilled: (1) distribution of valuation error is left-skewed and (2) the outlier effect of multiples distribution is mitigated.

Furthermore, I think there is a possibility that harmonic mean is happened to be a superior statistical estimator by chance even though the outlier effect of multiple distribution is not eliminated. The rationale is that the statistical estimator may produce best valuation accuracy due to the shape of sample distribution. Imagine that if the sample distribution is skewed to the left; hence, "mean < median < mode". It means that "*harmonic mean* ≤ mean < median < mode" since harmonic mean is always never larger than arithmetic mean. In contrast, if the distribution is skewed to the right; hence, "mean > median > mode" and arguably it denotes that "mean > median > mode" and "mean ≥ *harmonic mean*". In this scenario, median and harmonic mean is closer to each in right skewed distribution compared to left skewed sample distribution. Therefore, it is perfectly possible that harmonic mean and median will perform very close to each other in investigating on multiples' valuation accuracy.

In short, there are no consistent empirical evidences and theoretical framework suggest that using harmonic mean as statistical estimator for synthetic multiple will perform better in multiple valuation method; hence, I will choose median as statistical estimator for synthetic multiples in this thesis.

3.2   RESEARCH DESIGN

3.2.1   VALUATION ERRORS OF MULTIPLES

Researchers have reached a consensus to estimate predicted stock price based on synthetic multiple[2] from comparable firms based on theoretical concept of multiples (Alford 1992; Cheng & McNamara 2000; Liu, Nissim & Thomas 2001; Lie & Lie 2002; Schreiner & Spremann 2007; Mînjina 2009). That is, the predicted stock price is a product of value driver of a firm (i.e. the denominator of multiple) and synthetic multiple as show at equation (1). The key advantage of this approach it requires fewer assumptions than regression approach (Alford 1992).

$$\hat{p}_{i,t} = value\ driver_{i,t} * synthetic\ multiple_{i,t} \qquad (1)$$

Predicted stock (or firm) price and denominator of multiple are represented by $\hat{p}_{i,t}$ and $value\ driver_{i,t}$ at year "t" (or the whole period "t"). The synthetic multiple for firm "i" is indicated as $synthetic\ multiple_{i,t}$.

Since linear relationship is likely invalid between actual- and predicted price, valuation errors will existed as shown in equation (2) (Liu, Nissim & Thomas 2001; Schreiner & Spremann 2007). The $\varepsilon_{i,t}$ represents the valuation errors of firm 'i' at year 't' or period 't' and $p_{i,t}$ is the actual price. Since we are only interested in magnitude of valuation errors, the valuation errors can be re-arranged as shown in equation (3).

$$p_{i.t} = value\ driver_{i,t} * synthetic\ multiple_{i,t} + \varepsilon_{i,t} \qquad (2a)$$

$$p_{i.t} = \hat{p}_{i,t} + \varepsilon_{i,t} \qquad (2b)$$

$$|\varepsilon_{i,t}| = |p_{i.t} - \hat{p}_{i,t}| \qquad (3)$$

$$\left|\frac{\varepsilon_{i,t}}{\hat{p}_{i,t}}\right| = \left|\frac{p_{i.t} - \hat{p}_{i,t}}{\hat{p}_{i,t}}\right| \qquad (4)$$

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[2] Previous research used different terminologies for synthetic multiple. In this thesis, synthetic multiple is used. It is also equivalent to benchmark multiple or comparable multiple.

The last step in this approach is to scale predicted and actual price to control the size effects (Cheng & McNamara 2000). The purpose of scaling is to standardize valuation errors so that the valuation errors can be compared in percentage terms rather than magnitude. Previous research fails to reach consensus in choosing the scaling factor. Some researchers (Mînjina 2009; Schreiner & Spremann 2007; Liu, Nissim & Tomas 2001) chose the actual price as scaling factor since it is consistent with prior research (Alford 1992). On the other hand, some researchers (Park & Lee 2003; Cheng & McNamara 2000) adopted predicted price as scale factor since they believed it renders consistency in valuation errors. For example, if the under-predicted price and over-predicted price have equivalent distance from benchmark price, scaling by non-benchmark price (i.e. actual price) will make scaled absolute valuation error differs in magnitude. In contrast, scaling by predicted price will eliminate this problem. In this thesis, the predicted price is adopted as scaling factor. Scaled valuation errors that shown in equation (4) is denoted as $|\varepsilon_{i,t}/\hat{p}_{i,t}|$.

3.2.2 STATISTICAL ESTIMATOR AND MEASURE OF VALUATION ERRORS

In investigating the valuation accuracy of multiples, statistical estimator and statistical measures are important to indentify which multiple is more superior (Hermann & Richter 2003). In this thesis, the valuation performance of multiples is measured from distributions of valuation errors which are unlikely to be normally distributed. Therefore, median is a more robust statistical estimator to highly skewed data which is less sensitive to extreme outliers (Norman & Streiner 2008, p. 27). Nevertheless, the mean will be used as statistical estimator if the distribution of valuation errors is found to be almost normally distributed.

To increase the reliability of performance measure, the Wilcoxon Rank Sum test is used to assess the valuation errors of multiples on the basis of statistically superiority[3]. Wilcoxon rank sum test is similar to the two sample t-test except it is a non-parametric test and it does not assume population of the data is normally distributed. The only assumption required is that two independent samples have same shape of distribution. This is the null hypothesis in Wilcoxon rank sum test (Russo 2003, p.174)

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[3] The Wilcoxon Rank Sum test statistical is suggested by Herrmann and Richter (2003) and Mînjina (2009) to assess the statistical superiority of valuation errors of paired multiples.

which is to indentify if two comparable groups have same central tendencies (i.e. normally median is the index of central tendency). If null hypothesis is not true, it signifies two comparable groups have different central tendency and Wilcoxon rank sum test will generate the additional result to tell which group of data is systematically larger (or statistically superior) than others (Moore & McCabe 2005). In this study, the value, the sign of test statistic and the p-value of Wilcoxon rank sum test are obtained from Stata software. Note that this test is also known as the Mann-Whitney two-sample statistic in Stata software.

3.2.3   SELECTION RULE FOR COMPARABLE FIRMS

In the study, two selection methods are adopted in choosing comparable firms. First, the traditional approach – the industry membership is used to select the comparable firm. Second, the comparable firms are selected on the basis of ROE in same industry. Hitherto, there isn't any previous research available in guiding us to choose optimal number of comparable firms (Dittman & Weiner 2005); therefore, I will classify firms into four group which are: first group, the average ROE of firm is less than 5%; the second group, firms' average ROE is greater than 5% but less than 10%; the third group, firms' average ROE is more than 10% but less than 15%; the last group, the firms' average ROE is greater than 15%. I believe this classification will produce better comparable firms according to profitability growth rate.

3.2.4   SCOPE OF MULTIPLES

In this thesis, I decided to focus on equity multiples and exclude the entity multiples. The reason is that the enterprise value for entity multiple is not publicly available. Previous research assumed enterprise value is equivalent to the sum of market value of equity and book value of debt less cash and cash equivalent (Lie & Lie 2002). That is, the calculation of enterprise value is based on the assumption that cash and cash equivalent can be paid out to shareholders without affecting business operation. Unfortunately, the calculation fails to reflect actual firm's market debt value since it varies over time due to the changes of business cycle, financial liquidity in market and interest rate (Lie & Lie 2002). Few empirical studies showed that entity multiples yield very high valuation errors compared to equity multiples using aforementioned assumptions (Schreiner & Spremann 2007; Mînjina 2009). Therefore, I think that the entity multiple is less reliable than equity multiple. It is also inappropriate to compare

the performance of valuation errors between entity- and equity multiples since equity multiples do not make additional assumption.

In this study, I include five equity multiples which are P/S, P/E, P/B, P/CF and P/TA. Note that P/TA and P/S violate the consistency criteria which require the economic means for numerator and denominator of multiple should be matched (Damodaran 2006, p. 239). The rationale is that if numerator is market equity value then the denominator should also be a measure for equity value. However, multiples are included since they are widely used in previous research and in practice.

4.0   PLANTATION SECTOR IN MALAYSIA

The palm oil and rubber industries are known as main pillars of the plantation sector in Malaysia. According to Malaysian Rubber Export Promotion Council, Malaysia is ranked as third largest producer of natural rubber in 2009 in the world. On the other hand, Malaysian Palm Oil Council (MPOC) reported that Malaysia is the second largest producer and exporter of palm oil in the world in 2009. In 2006, MPOC further reported that there is about 570,000 people are directly employed in Palm Oil industry.

Palm oil plantation industry in Malaysia is primarily owned by large plantation companies. The majority of ownership of these companies is private- and government-linked companies (Pemandu 2010, p.282). In 2009, there is about 4.7 million hectares of oil palm plantations in Malaysia (Pemandu 2010, p.282). Smallholders owned 28% while independent smallholders owned 12% of total plantation land of palm oil plantation. The growth determinants of palm oil plantation industry (Pemandu 2010, p.283) are: (1) productivity gains which vary across large, medium and small plantations, smallholders and mills; (2) new plantation expansion; and (3) the investment of companies into downstream activities likes processed food, biodiesel, second generation bio-fuel and others.

Turning attention to rubber plantation industry in Malaysia, there was about 6.6 million hectares of rubber plantations in 2009 (Pemandu 2010, p.310). Independent and organized smallholders owned 94% of total plantation land of rubber industry. The growth prospect of rubber plantation industry relies on (1) the productivity gains for rubber which varies across the plantation companies and smallholders and (2) downstream products (i.e. rubber goods).

Recently, plantation sector is getting more attention from the local and foreign investors since it is believed that bull market of commodity cycle is underway. The increasing price trend becomes new growth driver of plantation sector in Malaysia. Since the beginning of this decade, the price of natural rubber and palm oil has increased dramatically. For example, the price of the Palm Oil was about USD 180 per tonne in 2000. It hit more than USD 1,100 per tonne in June 2008 and was around USD 1,200 per tonne in December 2010 after the financial crisis. On the other hand, the price of SMR CV (Standard Malaysia Rubber) natural rubber, which is very high quality and lean latex grades rubber, was about USD 0.88/KG in January 2000. The price rose to USD 2.70/KG in January 2008 and remained at around USD 5.00/KG in December of 2010. Overall, the price of Palm Oil has increased more than six times while price of natural rubble already increased about threefold.

I believe that the chosen plantation sector makes this study unique from previous research. This is because plantation firms generally employing simple and homogenous business model which differ from other industries such as information technology, manufacturing and finance industries. Furthermore, plantation firms are affected by same external factors (i.e. commodity price trend, demand and supply) in business profitability. Therefore, investigating the valuation accuracy of multiples (or value driver) in such industry renders empirical evidence to assist investors in choosing multiples in plantation sector and similar kind of industries (i.e. business model is homogenous and simple) to predict stock price effectively.

5.0   DATASET

In this thesis, the "Plantation Index" in Bursa Malaysia (also called Malaysia Stock Exchange) is used as the basis of identifying the firms in plantation sector. There are total 41 firms listed in "Plantation Index". The dataset is primary the multiples for firms over seven annual periods from 2003 to 2009. To construct the multiple dataset requires the price of common stock and other financial data. The price of common stocks is collected from *Yahoo! Finance* website whereas the financial data is obtained from the annual reports that published in official website of Bursa Malaysia. The reason to choose the study period from 2003 to 2009 is that stock price for many firms listed in "Plantation Index" are not available before 2003 in *Yahoo! Finance*. In

total, there are 260 firm-year observations after excluding the annual report that unavailable in the website of Bursa Malaysia.

In this study, some multiple samples are removed for the practical reasons. First, the study only adopts multiple samples with positive P/E and P/CF multiples since negative earnings and cash flow make multiples meaningless. Besides that, I do not remove any multiples from the dataset.

The variables of multiples are calculated as following ways. First, the value of equity is based on market capitalization which is a product of number of share and share price. The data about outstanding shares of firms are extracted from the annual reports. The price of equity is taken from the last closing price of trading day in the last month of financial calendar. The rationale of this approach is that it is more precise to match the share price and number of shares at certain point of day and it is not affected by stock split. Second, I choose the proxy of cash flow that is consistent with previous study (Park & Lee 2003). That is, I assume cash flow is net income plus depreciation and amortization. At last, other variables such as total revenue, earnings, book value of equity and asset are obtained from financial statements in firms' annual reports.

Damodaran (2006, p. 240) suggested that 'Descriptional Tests' such as average, median, standard deviation, standard error, minimum and maximum are necessary in relative valuation. This will render us the characteristics of multiple distributions before making comparison. However, I think that it is more appropriate to present the dataset with inter-quartile range since I believe analysts are more interested in middle concentration of distributions, which is less affected by outlier effect. Furthermore, the standard deviation and standard error are based on the belief the data is normally distributed which is unrealistic in practice.

Table 1 shows the means, median and inter-quartile of multiples and ROE for multiple dataset. Note that for all multiple distributions are skewed to the right since the mean is greater than median. The distribution of ROE is also skewed to the right in 2003 but the distributions of ROE are skewed to the left from 2004 to 2009. Inter-quartile range (IQR) in Table 1 represents the dispersion of data from the median with the boundary between first and third quartile. It can be seen that dispersion of P/E and P/CF multiples varies more significantly compared to others over the year. In total, there are to 1,506 observations for 5 multiples and ROE.

Table 1: Descriptive Statistics of Multiples and ROE

This table shows mean, median and inter-quartile range (IQR) of multiples in dataset. For multiples, the financial data (i.e. denominator) is derived from annual reports and the share price (i.e. numerator) is taken from closing prices on last trading day of firm's financial year. Note that the cash flow here is the sum of net income and cash and cash equivalent. ROE is return on equity.

Multiple	Descriptive Statistics	Year						
		2003	2004	2005	2006	2007	2008	2009
P/E	Mean	12.48	11.76	14.21	17.69	20.94	6.73	17.98
	Median	10.54	9.62	11.00	13.53	10.82	6.03	10.98
	IQR	7.48	6.83	8.72	7.12	3.66	3.98	5.25
Number of samples		29	30	28	33	38	37	35
P/B	Mean	0.83	0.82	0.74	1.06	1.55	1.15	1.23
	Median	0.67	0.71	0.68	0.77	1.24	0.73	0.90
	IQR	0.65	0.47	0.51	0.60	0.82	0.67	0.69
Number of samples		34	34	33	37	40	40	41
P/CF	Mean	11.88	9.05	12.06	12.23	13.35	8.63	31.39
	Median	8.49	7.55	8.63	10.65	8.88	5.61	8.94
	IQR	8.12	6.67	5.03	6.68	3.70	3.19	7.45
Number of samples		31	31	29	35	39	38	37
P/S	Mean	9.13	9.98	8.06	3.95	4.69	2.60	4.43
	Median	2.18	1.72	1.70	2.49	3.23	1.31	2.38
	IQR	3.31	3.39	3.83	3.01	3.07	2.36	3.98
Number of samples		35	35	34	37	39	39	40
P/TA	Mean	0.64	0.63	0.57	0.71	1.08	0.78	0.85
	Median	0.47	0.51	0.47	0.62	0.91	0.58	0.62
	IQR	0.57	0.42	0.50	0.52	0.75	0.50	0.65
Number of samples		34	34	33	37	40	40	41
ROE	Mean	7.11%	7.34%	4.40%	0.80%	6.77%	5.66%	7.62%
	Median	6.53%	7.59%	5.35%	5.12%	13.29%	12.10%	7.93%
	IQR	6.27%	5.76%	5.76%	7.02%	9.16%	11.16%	5.06%
No. of samples		34	34	33	37	40	40	41

6.0   EMPIRICAL RESULTS

6.1   VALUATION ERRORS WHEN COMPARABLE FIRMS ARE BASED ON PLANTATION SECTOR IN THE WHOLE SAMPLE PERIOD

Table 2 summarizes the performance measure of valuation errors and Wilcoxon rank sum statistical test results for multiples when comparable firms are selected on the basis of plantation sector. It is found that the distribution of valuation errors for all multiples is heavily skewed to the right and; therefore, median absolute error (MeAE)

is appropriate performance measure. On the other hand, the magnitude of Wilcoxon value and p-value from Wilcoxon rank sum test demonstrates that most paired valuation errors of multiples are statistically different at 5% significance level.

Table 2: Performance measure and Wilcoxon rank sum test result when comparable firms are based on plantation sector

Wilcoxon value less than 1.96 and p-value > 0.05 suggests the distribution of valuation errors is statistically indistinguishable at 95% significance level. If the two data distributions are statistically different, the negative (positive) Wilcoxon value indicates the value of valuation errors based on method in row (column) is systematically larger (less) than the one in column (row). Stated differently, the negative (positive) Wilcoxon value means the method in column (row) is statistically superior to method in row (column) in terms of valuation accuracy.

	Multiple				
	P/E	P/B	P/CF	P/S	P/TA
Performance Measure					
Mean Absolute Error (MAE)	0.66	0.60	0.72	2.76	0.60
Median Absolute Error (MeAE)	0.31	0.38	0.36	0.62	0.44
1st Quartile	0.11	0.22	0.15	0.30	0.21
3rd Quartile	0.59	0.62	0.58	1.20	0.71
Inter-Quartile Range	0.48	0.39	0.43	0.90	0.50
Wilcoxon value (p-value)					
P/B	-2.60 (0.01)				
P/CF	-1.28 (0.20)	1.23 (0.22)			
P/S	-7.47 (0.00)	-5.86 (0.00)	-6.46 (0.00)		
P/TA	-3.47 (0.00)	-1.19 (0.23)	-2.16 (0.03)	4.73 (0.00)	

The median absolute error (MeAE) indicates that P/E multiple yields a lowest valuation errors followed by P/CF, P/B, P/TA and P/S. Furthermore, the distribution of valuation errors for P/E multiple is systematically lower compared to the rest of multiples according to Wilcoxon value with the exception of P/CF. Turning attention to P/CF method, it produces slightly smaller median absolute error than P/B. Furthermore, Wilcoxon ranksum test result reveals the valuation errors between P/B and P/CF are statistically indistinguishable. However, the valuation errors of P/B are less dispersed in inter-quartile range compared to P/CF method.

It is interesting to note that P/S is the least accurate among all multiple methods and it produces 18% more valuation errors than P/TA method. Furthermore, valuation errors of P/S multiple has biggest dispersion in inter-quartile range. The Wilcoxon rank sum

test result also indicate that valuation errors for P/S multiple is systematically higher than all its paired multiples.

6.2 VALUATION ERRORS WHEN COMPARABLE FIRMS ARE BASED ON ROE IN PLATATION SECTOR IN THE WHOLE SAMPLE PERIOD

The performance measure and Wilcoxon rank sum test result of valuation errors for multiples when ROE is used as control factor in selecting comparable firms in plantation sector are shown in Table 3. The table indicates that the distribution of valuation errors for all multiples is positively skewed. Hence, median for distribution of valuation errors is a more robust estimator. Furthermore, the magnitude of test statistic and p-value for the Wilcoxon rank sum test demonstrates that most paired valuation errors of multiples are statistically indifferent at 5% significance level.

Table 3: Performance measure and Wilcoxon rank sum test result when ROE is used as control factor to select comparable firms from plantation sector

Wilcoxon value less than 1.96 and p-value > 0.05 suggests that distribution of valuation errors is statistically indistinguishable at 95% significance level. If the two data distributions are statistically different, the positive (negative) Wilcoxon value indicates the value of valuation errors based on method in column is systematically larger (less) than the one in row. Stated differently, the negative (positive) Wilcoxon value means the method in row (column) is better than method in column (row) in terms of valuation accuracy.

	Multiple				
	P/E	P/B	P/CF	P/S	P/TA
Performance Measure					
Mean Absolute Error (MAE)	0.64	0.62	0.81	1.51	0.63
Median Absolute Error (MeAE)	0.30	0.30	0.33	0.57	0.34
1st Quartile	0.10	0.10	0.12	0.30	0.12
3rd Quartile	0.55	0.57	0.58	0.90	0.63
Inter-Quartile Range (IQR)	0.46	0.46	0.46	0.61	0.50
Wilcoxon value (p-value)					
P/B	-0.21 (0.83)				
P/CF	-0.60 (0.55)	-0.39 (0.70)			
P/S	-6.70 (0.00)	-6.88 (0.00)	-6.47 (0.00)		
P/TA	-1.66 (0.10)	-1.43 (0.15)	-1.04 (0.30)	5.31 (0.00)	

It is discovered that the P/E and P/B multiples yield similar median absolute error which is smallest among all multiples. The valuation errors of P/E and P/B are also

dispersed equally in terms of inter-quartile range and they are statistically indistinguishable according to Wilcoxon rank sum test results.

On the other hand, the result reveals that P/CF method performs better than P/TA in most aspects. The valuation accuracy of P/CF multiple is slightly better than the P/TA multiple according to median absolute error. The valuation errors of P/CF multiple is also less dispersed in inter-quartile range. Despite this, the result of Wilcoxon rank sum test indicates P/CF method is statistically indifferent to P/TA method.

It is observed that P/S is the worst method among all multiples. First, P/S multiple produces the biggest median absolute error. In addition to that, the value of the valuation errors for P/S multiple is most dispersed in inter-quartile range and it is systematically larger than its pairs as shown in Wilcoxon rank sum test result.

6.3   VALUATION ERRORS WHEN COMPARABLE FIRMS ARE BASED ON PLANTATION SECTOR

The valuation performances for multiples from 2003 to 2009, which comparable firms are selected on the basis on plantation sector membership, are shown at Table 4. It is observed that the distribution of valuation errors for all multiples is heavily skewed to the right. The only exception is P/B method in 2005 which median is almost equal to mean. The result suggests that the median absolute error is appropriate performance measure. Furthermore, the Table 4 indicates the inter-quartile range for distribution of valuation errors for all multiples varies significantly over year. It also can be seen that P/E method produces smaller median absolute error than P/B method from 2004 to 2009. However, valuation errors of P/E method are more dispersed than the one of P/B method. Another important point is that the valuation errors of P/S method is most dispersed in terms of inter-quartile range in all years.

The Figure 1 shows the median absolute error (MeAE) for five multiples from 2003 to 2009. The first impression is that all MeAE fluctuates wildly over the year. The only exception is MeAE of P/B method which consistent between 0.35 and 0.45. Although the P/E method is found to be inconsistent, yet it produces smallest valuation errors from 2005 to 2008. It also performs relatively well in 2003, 2004 and 2009 (i.e. second top performance measure). The P/TA method achieves top performance in 2004 but it performs poorly in the rest of year compared to P/E, P/B and P/CF

methods from 2003 to 2008. Lastly, P/S method appears the worst method with highest MeAE for all years. It drops to 0.5 levels in 2007. In other years, it remains at about 0.60 to 0.70 levels.

Table 4: Performance measure of valuation errors that comparable firms are based on plantation sector from 2003 to 2009

Multiple	Performance Measure	Year						
		2003	2004	2005	2006	2007	2008	2009
	Mean Absolute Error (MAE)	0.61	0.62	0.51	0.57	1.23	0.37	0.59
P/E	Median Absolute Error (MeAE)	0.41	0.38	0.22	0.28	0.18	0.28	0.43
	Inter-quartile range (IQR)	0.57	0.40	0.60	0.30	0.35	0.46	0.61
	Mean Absolute Error (MAE)	0.54	0.47	0.43	0.73	0.60	0.90	0.44
P/B	Median Absolute Error (MeAE)	0.39	0.38	0.43	0.38	0.33	0.40	0.37
	Inter-quartile range (IQR)	0.58	0.41	0.34	0.30	0.37	0.32	0.27
	Mean Absolute Error (MAE)	0.83	0.58	0.70	0.48	0.76	0.86	0.79
P/CF	Median Absolute Error (MeAE)	0.52	0.42	0.37	0.32	0.24	0.31	0.55
	Inter-quartile range (IQR)	0.79	0.35	0.40	0.30	0.49	0.35	0.77
	Mean Absolute Error (MAE)	3.69	5.23	4.18	1.08	0.91	1.36	3.39
P/S	Median Absolute Error (MeAE)	0.69	0.63	0.67	0.58	0.48	0.62	0.70
	Inter-quartile range (IQR)	0.80	1.41	1.35	0.54	0.53	1.18	0.57
	Mean Absolute Error (MAE)	0.67	0.55	0.57	0.57	0.55	0.74	0.53
P/TA	Median Absolute Error (MeAE)	0.52	0.31	0.52	0.46	0.40	0.42	0.47
	Inter-quartile range (IQR)	0.84	0.49	0.58	0.46	0.37	0.45	0.41

Figure 1: Median absolute error when comparable firms are selected on the basis of plantation sector
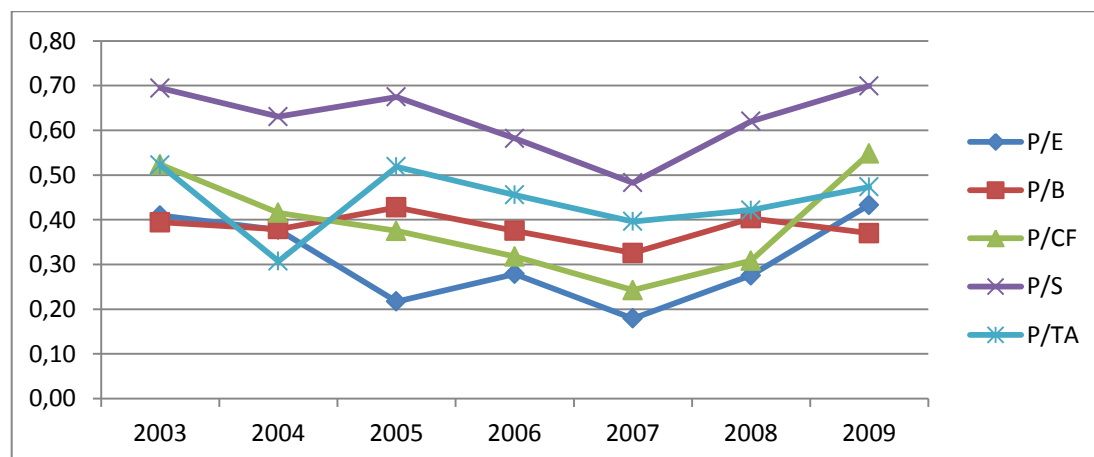
6.4 VALUATION ERRORS WHEN COMPARABLE FIRMS ARE BASED ON ROE IN PLANTATION SECTOR

The Table 5 displays the performance measure of valuation errors for multiples when comparable firms are selected on the basis of ROE within the plantation sector. The table shows that multiples produce positive skewed distribution of valuation errors in all years. It seems that the P/E, P/B and P/CF methods perform relative well in terms of median absolute error. Moreover, the valuation errors of P/E method demonstrate very stable dispersion between 0.41 and 0.48 within inter-quartile range over years. For the P/S method, the distribution of valuation error is the most highly skewed and it yields biggest median absolute error.

Table 5: Performance measure of valuation errors that comparable firms are based on ROE control factor in plantation sector from 2003 to 2009

Multiple	Descriptive Statistics	Year						
		2003	2004	2005	2006	2007	2008	2009
	Mean Absolute Error (MAE)	0.65	0.55	0.45	0.54	1.09	0.36	0.77
P/E	Median Absolute Error (MeAE)	0.40	0.39	0.32	0.18	0.21	0.26	0.25
	Inter-quartile range (IQR)	0.46	0.41	0.43	0.46	0.48	0.45	0.48
	Mean Absolute Error (MAE)	0.54	0.47	0.42	0.58	0.53	0.94	0.76
P/B	Median Absolute Error (MeAE)	0.36	0.35	0.28	0.21	0.24	0.28	0.30
	Inter-quartile range (IQR)	0.51	0.33	0.32	0.53	0.39	0.47	0.28
	Mean Absolute Error (MAE)	0.60	0.43	0.54	0.36	0.65	0.86	1.97
P/CF	Median Absolute Error (MeAE)	0.35	0.33	0.40	0.25	0.23	0.32	0.38
	Inter-quartile range (IQR)	0.49	0.38	0.55	0.43	0.49	0.38	0.47
	Mean Absolute Error (MAE)	1.43	2.09	3.31	1.08	0.94	1.12	0.89
P/S	Median Absolute Error (MeAE)	0.69	0.49	0.54	0.55	0.49	0.56	0.63
	Inter-quartile range (IQR)	0.82	0.85	0.67	0.55	0.52	0.63	0.62
	Mean Absolute Error (MAE)	0.63	0.60	0.58	0.55	0.48	0.76	0.77
P/TA	Median Absolute Error (MeAE)	0.47	0.24	0.37	0.35	0.27	0.39	0.30
	Inter-quartile range (IQR)	0.63	0.58	0.52	0.62	0.38	0.44	0.53

Furthermore, it is found that P/CF and P/B methods produce lowest MeAE in 2003 while P/TA method posses smallest MeAE in 2005. The P/B method achieves best performance measure in 2004. Then, P/E method appears to be top performance measure from 2006 to 2008. It is also important to note that performance measure of P/B method is either in top one or top two positions from 2003 to 2009. Lastly, P/S method appears the worst method with highest MeAE for all years. It remains at about 0.50 to 0.70 levels in all years.

The Figure 2 shows that median absolute error (MeAE) for all multiples from 2003 to 2009. It is worth to note the MeAE for multiples are seemed to be fluctuated within certain range over years. For instances, the MeAE of P/B and P/CF is fluctuated approximately within the range of 0.10 and 0.15 respectively. For P/E, P/TA and P/S methods, the magnitude of fluctuation is limited within 0.20 levels.

Figure 2: Median absolute error when comparable firms are selected on the basis of ROE in the plantation sector
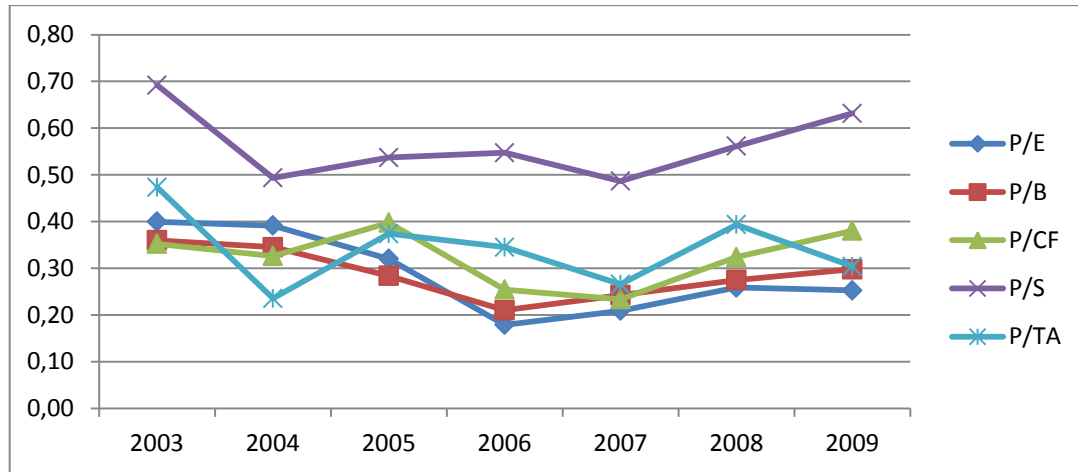
6.5   FURTHER ANALYSIS AND DISCUSSION

Overall, the empirical result in this study is consistent with findings from similar previous research. First, the study result shows that P/E multiple yields smallest median absolute error in the plantation sector in the whole sample period. Similarly, Schreiner and Spremann (2007) found that P/E multiple produces smallest valuation errors in comparison to multiples such as P/B, P/CF, P/S and P/TA for European firms. Another important result from this study is that the P/E multiple is found to be a better method than P/B multiple in the whole sample period. This result is identical to findings from Cheng and McNamara (2000), which they found that valuation accuracy of P/E is higher than P/B. Furthermore, my result indicates that P/S multiple is the least accurate method and produce significant bigger size of median absolute error compared to P/E, P/B, P/CF and P/TA method. The concordance of the result is discovered in Bucharest Stock Exchange in Romania (Mînjina 2009). This denotes that although P/S multiple is the least likely to be manipulated from accounting perspective, it does not provide reliable result.

On the other hand, the empirical result from this study is a testament to the effectiveness of ROE control factor in choosing comparable firms within plantation sector, which causes the valuation errors of all multiples become smaller as shown at Table 6. Clearly, it shows the median absolute error of P/E, P/B, P/CF, P/S and P/TA methods improve when ROE is used as control factor in plantation industry in the whole sample period. Note that P/TA and P/B experience greater improvement than other multiples. This finding is not surprising since previous research also obtained similar results. First, Cheng and McNamara (2000) found that using combination of industry membership and ROE (IND-ROE) to select comparable firms yield best performance estimation for P/E and P/B multiples compared to industry membership, size, ROE, and combination of industry membership and size. Second, Dittman and Weiner (2005) also discovered that using return on assets as selection method of comparable firm produces smaller valuation errors of multiples than selection methods based on industry membership and total assets. Lastly, Mînjina (2009) found that using ROE as selection method of comparable firm across industries yields lower valuation errors of multiples than using industry membership.

However, it should be noted that the median absolute error of P/E experiences very small improvement in valuation accuracy (i.e 0.01) after ROE is used as control factor according to Table 6. Similarly, Alford (1992) also found that selecting firms with similar risk or earnings growth rate (i.e. ROE as proxy) only contribute small improvement in the valuation accuracy of P/E multiple. Arguable this result may be attributed to the nature of P/E multiple, which investors view it as proxy of future profitability growth. Since the P/E multiple already absorbed profitability growth effect, adding ROE control factor in the plantation sector may not result significant improvement on the valuation performance of P/E multiple.

Table 6: Difference of median absolute error for multiples after ROE is used as control factor in plantation industry in the whole sample period

Performance Measure	Multiple				
	P/E	P/B	P/CF	P/S	P/TA
Median Absolute Error (MeAE)	-0.01	-0.08	-0.04	-0.05	-0.10

Turning attention to the valuation errors for multiples from 2003 to 2009, it is found that when ROE is used as control factor in the plantation sector, the median absolute

error of all multiples become smaller almost every year, which is displayed in Table 7. This result also supports the argument that ROE is an effective control factor in same industry in selecting comparable firms.

Table 7: Difference of median absolute error for multiple methods when ROE is used as control factor in plantation industry from 2003 to 2009

Multiple	Performance Measure	Year						
		2003	2004	2005	2006	2007	2008	2009
P/E	Median Absolute Error (MeAE)	-0.01	0.01	0.10	-0.10	0.03	-0.02	-0.18
P/B	Median Absolute Error (MeAE)	-0.03	-0.03	-0.14	-0.17	-0.08	-0.13	-0.07
P/CF	Median Absolute Error (MeAE)	-0.17	-0.09	0.02	-0.06	-0.01	0.02	-0.17
P/S	Median Absolute Error (MeAE)	0.00	-0.14	-0.14	-0.03	0.00	-0.06	-0.07
P/TA	Median Absolute Error (MeAE)	-0.05	-0.07	-0.14	-0.11	-0.13	-0.03	-0.17

6.6   CAVEAT OF THE STUDY

In this study, the companies listed in 'Plantation Index' in Bursa Malaysia are regarded as plantation firms. Despite the fact that the core business of these firms is plantation, these companies have involved in other business activities. Unfortunately, there is no other public information available to improve the definition of firms of plantation sector in Malaysia. Someone might argue analyst can solve this issue through analyzing the annual reports of firms to identify better comparable firms through their proportion of business activities. This approach, however, is time consuming and it is more appropriate for comprehensive financial analysis on few selected firms.

Another caveat of the study is that the valuation performance of P/E multiples may partly attributed to the biasness in data processing. That is, the negative P/E multiple in dataset are removed for practical reasons. As a consequence, the valuation performance of P/E multiple may becomes more accurate due to biasness. This problem also applies to P/CF multiple since negative P/CF multiples are not included.

The study result reveals that using ROE as control factor in the plantation sector reduce the fluctuation range of median absolute error for multiples. This also means the time variation of valuation error of multiples become consistent. Having said that, time variation of valuation errors may not render consistent prediction of future median absolute error of multiples under the same methodology.

7.0   CONCLUSIONS AND SUGGESTION FOR FUTURE RESEARCH

In this thesis, the performance measures of five multiples (i.e. P/E, P/B, P/CF, P/S and P/TA) are measured for plantation sector in Malaysia. There are two classification methods of comparable firms which are (1) plantation sector membership and (2) the combination ROE and plantation sector membership. The dataset of the multiples consists of 260 firm-year observations. The market price information and financial data is derived from *Yahoo! Finance* website and annual reports respectively for the firms listed in 'Plantation Index' at the Bursa Malaysia from 2003 to 2009.

When the plantation sector is used as the basis to select comparable firms, it is found that the P/E multiple yields most accurate valuation performance. The Wilcoxon rank sum test result also shows that valuation performance of P/E multiple is systematically more accurate than all multiples from 2003 to 2009 with the exception to P/CF. In contrast, the P/S multiple is the worst valuation method and it is also statistically inferior to all multiples from 2003 to 2009.

If the combination of ROE and plantation sector membership is used to select the comparable firms, the P/E and P/B multiples yield best valuation performance followed by P/CF, P/TA and P/S multiple. The result from Wilcoxon rank sum test demonstrates that the P/E valuation method is statistically indistinguishable to all paired multiples except to P/S multiple. On the contrary, the valuation performance of the P/S multiple is the worst in terms of median absolute error and it systematically produces bigger valuation errors than all paired multiples. At last, the valuation performance of all multiple methods is found to be improved after ROE is used as control factor in the plantation sector. However, it only yields small positive improvement on valuation performance of P/E multiple.

On the other hand, when comparable firms are selected on the basis on plantation membership, the result shows that the valuation performance for each multiple method is inconsistent over the studied period. Using ROE as control factor can mitigate the problem to cause the valuation performance of multiples fluctuates in smaller range.

The study found that P/TA and P/S are the most unreliable multiples in terms of valuation errors compared to other equity multiples in both definitions of comparable

firms. The P/S and P/TA multiples share a common trait, which the economic means of numerator is unmatched to denominator. This is a violation of consistency and it may cause mis-pricing in valuation (Damodaran 2006, p. 239). Generally, the total assets and sales are regarded as value drivers of enterprise value and vary across the firms due to the different financial and operating leverage. For example, the firm uses the gross profit from sales to pay debt service in order to maintain business operation. It should also be understood that sales are a flow available to all suppliers of capital. Similarly, the total assets of a firm, which are the total of debt and equity, are owned by shareholders and debtors making total assets is an underlying value driver for enterprise value.

Overall, the empirical result in this study is robust and statistical significant. This study renders four important findings in equity multiple valuation method for analysts who are interested in the plantation sector in Bursa Malaysia: first, when plantation sector membership is used as the basis on selecting comparable firms, the P/E multiple assures top valuation performance; second, when ROE is used as control factor in the plantation sector, this leads to performance improvement for multiples; third, the P/S multiple should be avoided in valuation context; and, earnings is the most significant value driver in plantation industry compared to book value of equity, cash flow, sales, and total asset for equity multiples.

The empirical result in this study shows that using ROE as control factor in same sector to select comparable firms only produce small positive effect on valuation performance of P/E multiple. Therefore, it is suggested that future research can be devoted into identifying more effective control factors for P/E multiple. The control factors such as firm size and equity beta may be considered.

At last, the study shows that P/E is the most reliable multiple which may be attributed to the unique characteristic of the plantation sector. The firms in plantation sector are homogenous with simple yet similar business model. This implies that in such industry, earnings is probably the prime value driver of market equity price. Therefore, I strongly suggest that future research can be carried out to investigate the valuation accuracy in similar type of industries. In turn, this will provide new insights into theoretical framework to guide analysts in choosing multiples.

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APPENDIXES

A.   DATA AND SPECIFICATION OF MULTIPLES

Data

The financial data is obtained from the annual reports of firms that are constituents of Sectorial Index – Plantation[4] in Bursa Malaysia, which is one of Bursa Malaysia Index Series. The annual reports are available at Bursa Malaysia website under "company announcement". The prices of the stock are taken from the http://finance.yahoo.com .

This study encompasses the seven annual period from 2003 to 2009. The reason is that data about stock price for firms listed in Plantation Index are not widely available. The only public source is the *Yahoo Finance website* and it does not cover most of stock price data before 2003. In contrast, Yahoo Finance website provides almost all of stock prices of firms listed in Plantation Index between 2003 and 2009.

The data about outstanding shares of firms are extracted from the annual reports each year. On the other hand, the data used in multiples are taken from the income statement and balance sheet in the annual reports.

Price:

P: Price per share. The share price is the closing price of last trading day in last month of the financial calendar for the company.

Value drivers of equity value multiples:

E: The net income from income statement

B: The shareholder's equity from balance sheet

CF: Cash flow is the sum of net income, depreciation and amortization from income statement

S: Sales or revenue from income statement

TA: Total assets from the balance sheet

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[4] The firms that are listed as PLANTATION Components As At December 30, 2010