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DETERMINANTS OF COST OF EQUITY OF MALAYSIAN FIRMS

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ABSTRACT

This paper investigates the determinants of cost of equity of Malaysian firms using various CAPM models. A two-factor model that is general enough to encompass the features of a partially integrated market is proposed in this study. The downside risks proposed by Estrada (2000) are also considered. The results show that the downside risk of the semi-deviation approach provides the most relevant measure for calculating cost of equity. The analysis using fixed-effect panel models shows that debt-to-equity ratio, earnings per share, total asset turnover ratio, firm size and stock liquidity are important determinants of cost of equity.

Keywords: Cost of Equity, Determinant, Downside Risk, CAPM, Emerging Market.

1. INTRODUCTION

The gradual openness of the capital markets of developing countries has transformed them into attractive investment destinations. Among others, Malaysia has emerged to be an up and coming investment destination for many large transnational corporations. In 2007, FDI net inflows to the country rose by 54.4% to reach $9.4 billion, with manufacturing, particularly the electrical and electronics subsector, contributing more than half of the total (Asian Development Bank, 2008). Malaysia's financial sector is well developed, with an equity market size of about 111% of the country's GDP in 2008.[1] The domestic market capitalization (in USD millions) of its exchange was the highest among the Association of Southeast Asian Nations (ASEAN) countries before being superseded by Singapore at the end of 2004, and was once ranked the third highest in Asia (excluding Australia), after Japan and Hong Kong before the 1997 Asian financial crisis.[2] Nonetheless, the trade policy review by the World Trade Organization (WTO) on Malaysia in 2001 reported that *"… both capital and total factor*

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[1] Calculated as total market capitalization of Bursa Malaysia divided by GDP at current prices (2008). Data is available in tables 3.4.2 and 2.12 of the website of the Central Bank of Malaysia (http://www.bnm.gov.my/).

[2] Calculated from the published statistics of World Federation of Exchanges.

productivity (TFP) growth had dropped markedly (from an annual average rate of 2.4% in 1990-1995 to 0.9% in 1995-2000), perhaps reflecting over-investment, if not an increasingly inefficient allocation of capital." Besides total factor productivity, it is clear from the report that inefficient allocation of capital is a major concern for Malaysian firms. The efficiency of capital allocation is an outcome of investment decision. The ability of firms to allocate capital efficiently in order to generate high returns for stockholders is related to the issue of cost of capital from the corporate finance perspective

Accurate estimation of a firm's cost of capital is vital for making many financial decisions, for example, choice of capital structure, capital budgeting analysis, performance assessment and firm valuation. Being one of the key components, the cost of equity is a significant input for calculating cost of capital. The use of an incorrect cost of equity can have serious consequences such as losing market share to competitors or losing market value, since an overestimation of cost of equity may lead to rejection of promising investment opportunities while an underestimation may result in value-destructive investments. The result of applying less appropriate models to estimate cost of equity can therefore be detrimental.

A recent survey by Abdul Samad and Shaharuddin (2009) on 83 Malaysian firms found that majority of them used the CAPM to estimate cost of equity.[3] They reported costs of equity to be between 4 to 8%. However, the market-level cost of equity for Malaysia was shown to be 10.65% using the CAPM and 12.34% using a downside risk model by Estrada (2002, 2007). Both papers by Estrada consistently documented evidence that downside risk has a stronger explanatory power on stock returns than the standard risk measure (beta) of CAPM. Chen and Chen (2004) and Foong and Goh (2010) also provided support to Estrada's findings. As the emerging capital market of Malaysia is only partially integrated in the world market, the use of CAPM that assumes full integration may not be appropriate, hence rendering the cost of equity to be underestimated. The choice of an appropriate model appears to be a critical issue.

In the quest to search for the best asset pricing model, the current paper works with the CAPM since it is most widely applied among practitioners. The choice bears some merits since practitioners are the end users who rely on the model for financial decision making. Although the CAPM receives widespread popularity in the corporate world, there is no consensus in the literature as to which of the CAPM variants is the best for estimating cost of equity. Generally, the local CAPM (LCAPM) where variations in firm returns are explained only by local market movements should be used when appraisers believe that markets are perfectly segmented. If markets are fully integrated, a global CAPM (GCAPM) should be used instead as the model postulates the global market to be the only source that explains fluctuations in firm returns. When estimating cost of equity for emerging markets, problem arises as studies have shown that they have become partially integrated into the world capital market network (see Bekaert and Harvey, 1995 and Bekaert *et al.* 2005).

[3] Empirical evidence suggests that CAPM is also extensively used for other countries such as U.K. (Arnold and Hatzopoulos, 2000; AL-Ali and Arkwright, 2000; McLaney *et al*. (2004), U.S. (Bruner *et al*., 1998; Graham and Harvey, 2001), Australia (Truong *et al*., 2008) and South Africa (Correia and Cramer, 2008).

Modifications were introduced to suit the setting of emerging markets. Most of the proposed models are modifications of the traditional one-factor CAPM, see for example, Lessard (1996), Godfrey and Espinosa (1996), Mariscal and Hargis's (1999), Pereiro (2001) and Damodaran (2003). There are also non-CAPM-based models such as Erb *et al.*'s (1996) credit rating model and Estrada's (2000, 2001) downside risk model. These studies, nonetheless, do not consider both local and global factors simultaneously. Since Malaysia is partially integrated into the world capital market, the current study examines the use of models which include both factors for estimating cost of equity. The results are compared to the downside risk model, given that risks are believed to be on the downside for emerging markets.

While research on estimating cost of equity is somewhat well established, the literature is lacking of studies that examine determinants of cost of equity. In many studies, the exploration for determinants is not the primary objective. Rather, it is a peripheral product of the investigation on the effect of various factors such as corporate governance (Chen *et al*., 2009, Guedhami and Mishra, 2009), financial liberalization (Ameer, 2007), earnings forecast (Rakow, 2010) and liquidity (Lin *et al*., 2009) on cost of equity. Omran and Pointon (2004) and Sung *et al.* (2008) are few of the studies that focused on examining the determinants of cost of equity. Observation from these studies showed that financial ratios are commonly used in examining the relation between firm-specific risk factors and cost of equity. Therefore in this study, one ratio is chosen to represent each of a firm's five basic categories of financial ratios, namely, liquidity, debt, profitability, activity and market. Their respective ratios are current ratio (CR), debt-to-equity ratio (DE), earnings per share (EPS), total asset turnover ratio (TAT) and market-to-book ratio (MB). On top of that, firm size and liquidity were also included as potential determinants of cost of equity.

The study has highlighted a few important points. First, measures of cost of equity could be improved when taking downside risk into consideration. Second, three of the five significant determinants of cost of equity, namely, debt-to-equity ratio, earnings per share, total asset turnover ratio, are accounting-based variables. This highlights the importance of accounting attributes in determining cost of equity of Malaysian firms.

2. METHODOLOGY AND DATA

This section is divided into three parts. The first part discusses the CAPM variants used for estimating cost of equity. The second part provides a list of potential determinants and their expected relationship with cost of equity. The third part explains the data used in the study.

2.1. Measuring Cost of Equity

Modern financial economics assumes that the risk perception of investors is reflected in the cost of equity of the firm. Being risk-adverse, investors will demand a higher return when the perceived risk is larger. The cost of equity for a firm is typically computed by adding up the risk-free rate and a premium for exposure to systematic risk, as follows:

Cost of Equity = (Risk-Free Rate) + (Risk Measure) x (Market Risk Premium)

or

$$E(CE_i) = R_f + \beta_i \, (R_m - R_f) \qquad (1)$$

where $E(CE_i)$ represents the expected cost of equity for firm i, R_m is the return on the benchmark market portfolio, R_f is the return on the risk-free asset, and β_i measures the sensitivity of the firm return to the benchmark market return. This approach does not take firm-level unsystematic risk into account because firm specific risk can be diversified away and hence should not be incorporated into the calculation of the cost of equity. The systematic risk reflected in β_i is important for evaluating firm performance, and it is conventionally estimated via a CAPM using time-series data:

$$r_{it} = \alpha_i + \beta_i r_{mt} + \varepsilon_t \qquad (1a)$$

where r_{it} is the excess return for firm i and r_{mt} is the excess return for the market portfolio. After an estimate for β_i is obtained, it can then be applied into equation (1) for calculating the cost of equity.

The issue of contention in the above setting is the relevant risk-free rate (R_f) and the benchmark market portfolio (R_m) to be used in the estimation of the beta coefficient, and subsequently the calculation of cost of equity. A few variants are considered in this paper. In its original form, the setting of the CAPM derived by Sharpe (1964), Lintner (1965) and Mossin (1966) assumes that the benchmark portfolio is the local market portfolio and that it is the only source of systematic risk for firms. This assumption is based on the segmentation of financial markets during the 1960s, and it has been a standard practice to use a local version of the CAPM which considers only the variations in stock return relative to domestic market movements. Hence, the local setting uses the local market index (R_M) and the domestic risk-free rate (R_F) for estimating the beta coefficient and cost of equity. The replacement of these variables in equation (1) and (1a) yields what we refer to as the local CAPM (LCAPM, henceforth). The LCAPM specification is given in Table 1, where equation (2a) is applied for the estimation of the beta coefficient, and the cost of equity is calculated based on equation (2).

With liberalization and development of the world financial sector after the 1980s, equity markets have become increasingly integrated. In a fully integrated global capital market, diversification is not limited only to within domestic market but also extends across national boundaries. A global CAPM is then relevant because the return premium to any investment, when measured in a similar currency unit, is the same for all investors. The beta of each stock is measured with reference to the global capital market index and the market premium to be used is the global equity risk premium.[4] We refer to this model as the global CAPM (GCAPM,

[4] Stulz (1995) believes that the progressive integration of world financial markets has significantly reduced cost of capital of firms around the world. To reflect this, he suggested using a global CAPM instead of the local CAPM. The global market portfolio is used to replace the local market portfolio in his model.

henceforth), where the reference return is computed from the global market index (R_F^G) and the global risk-free rate (R_M^G) is used. The global beta is estimated from equation (3a) and the cost of equity is given by equation (3) in Table 1.

LCAPM and GCAPM are only valid under the extreme condition of a fully segmented or fully integrated world capital market respectively. Tests of the classic CAPM under the hypothesis of full market integration have rejected the adequacy of a single source of risk for explaining variation of returns across countries (see Harvey, 1991), suggesting that the world capital market is not fully integrated. Driven by the possibility that the world capital market is neither fully segmented nor fully integrated, as well as the findings of Bekaert and Harvey (1995) and Bekaert *et al.* (2005) that some emerging markets are partially integrated with the global capital market, this study proposes a two-factor model which introduces a global market factor into the classic CAPM, hereafter denoted as 2F-CAPM.[5] The 2F-CAPM setting, as given in equations (4) and (4a) in Table 1, includes two types of premium, one to compensate for the exposure to the local market and another for the global market.

The findings of Harvey (1995) and Erb *et al.* (1996) showed that betas are not significantly correlated with expected returns for emerging markets. The works of Estrada (2002) and Chen and Chen (2004) documented evidence that downside beta has a stronger explanatory power on stock returns than standard beta. Taking their findings into consideration, this study proposes a downside version of the LCAPM, GCAPM and 2F-CAPM, where the standard beta risk measures in equation (2), (3) and (4) are replaced with downside beta. The calculation of downside beta involves isolating instances when the firm and local market returns are less than zero.[6] The downside series for the firm, market and global market returns that have values less than or equal to zero, are generated. These series are r_{it}^D = min (r_{it},O), r_{Mt}^D = min (r_{Mt},O), and r_{Mt}^{DG} = min (r_{Mt}^G,O), respectively. They are used in the regression equations (5a), (6a) and (7a) stated in Table 1 to obtain the betas from the downside versions of the LCAPM, GCAPM and 2F-CAPM, denoted as DLCAPM, DGCAPM and 2F-DCAPM, respectively. The downside betas from these models provide a risk measure of the potential loss if the market were to suffer a decline. These downside market risk measures are substituted in equations (5), (6) and (7) to obtain the cost of equity.

Existing empirical evidence has questioned the validity of the classical CAPM for applications in emerging markets. For example, Harvey (1995) and Estrada (2000) showed that standard betas are not correlated with world market returns. In addition, beta values seemed too small

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5 A two-factor setting is common in the literature of asset pricing for partially integrated markets. However, there are a few different approaches, see for example, Errunza and Losq (1985), Errunza *et al*. (1992), Kearney (2000) and Gérard *et al*. (2003).

6 Chen *et al*. (2004) found that downside risk measure relative-to-zero return rate, which is a measure relative to investors' net wealth effect, has stronger power in explaining future return than downside risk measure relative-to-mean return rate (measure relative to the market performance). This finding is consistent with their hypothesis that investors are more concerned with their net wealth effect than the market relative performance.

to reflect costs of equity that investors would deem as reasonable. These problems have led to the search for risk measures beyond the realm of CAPM. One of such initiatives is by Estrada (2000, 2001) who suggested to measure total risk as the standard deviation of returns, and downside risk as the semi-deviation of returns. The measures using standard deviation and semi-deviation of returns to calculate cost of equity are stated in equations (8) and (9), respectively, in Table 1.

2.2. Selection of the Best Risk Measure

Eight risk measures have been proposed for the calculation of cost of equity. It is of interest to find one risk measure that gives the best fit in the calculation of cost of equity. Previous works, including Estrada (2000, 2001, 2002) and Chen and Chen (2004) used the risk-return approach to compare the performance of risk measures. Actual stock returns, used as proxy of the ex-post cost of equity, were regressed on each of the risk measures under investigation in either cross-section regressions (Estrada, 2000, 2001, 2002) or pooled regressions (Chen and Chen, 2004). The coefficients of determination (R^2) of the models were compared to decide on the best risk measure.

We follow this approach and estimate the following pooled regression of the firm stock returns on the estimated risks:

$$r_{it} = \gamma_0 + \gamma_1 \beta_{it}^{panel} + \varepsilon_{it} \tag{10}$$

where $i = 1, 2, ..., n$, n is the number of firms, $t = 1, 2, ..., T$, T is the number of time-series observations, r_{it} is the stack series of the firm stock returns, and β_{it}^{panel} is the stack series of the risk measure estimates. The estimation of equation (10) is repeated for the different risk measures given in Table 1. The R^2 and adjusted R^2 of the estimated models provide the criteria for finding the risk measure with the highest explanatory power.

2.3. Determinants of Cost of Equity

The cost of equity calculated using the risk measure from the model with the best fit is employed subsequently to find the potential determinants of cost of equity. Past studies (see for example, Omran and Pointon, 2004 and Sung *et al.*, 2008), showed in general that firm-specific determinants can be grouped into two main categories. The first category includes variables measuring accounting information only (accounting-based). The second category of variables are measured based on the relations between market and accounting data (market-based). These variables are financial ratios from a firm's income statement, balance sheet, or both.

Financial ratios are typically divided into five basic categories, namely, debt, activity, liquidity, profitability and market ratios. Debt, activity and liquidity ratios measure mainly the risk factors of a firm. Ratios related to profitability are measures of returns. Market ratios capture both the risk and return factors of a firm. Since each of the five categories can be measured by different financial ratios, one ratio is chosen to represent each category. As there could be many potential determinants of cost of equity, we choose only the variables that are commonly employed in past studies. A total of five variables are identified (see discussion below). An additional two variables, firm size and stock liquidity, which have significant effects on the variations of cost of equity, are also included in the analysis. The determinants and the hypothesized relationship of these variables with cost of equity are discussed below.

2.3.1. Accounting-based variables

(a) Current Ratio, CR (positive/negative)

Current ratio is normally used as an indication of a firm's ability to fulfil short-term obligations. Higher current ratio means the firm has more short-term assets (cash, receivables, and inventory) and hence has better ability to pay off its obligations. High liquidity also ensures that the firm is able to take on profitable investment when they become available. On the other hand, a higher ratio could suggest inefficient use of funds. Therefore, the relationship of current ratio with cost of equity could be positive or negative. Omran and Pointon (2004) found current ratio to be negatively related to cost of equity. CR is defined as total current assets divided by total current liabilities.

(b) Debt-to-Equity Ratio, DE (positive)

Debt-to-equity ratio measures the amount of a firm's debt financing in relative to its equity financing. Modigliani and Miller (1958) established that cost of equity is a function of leverage (debt-to-equity ratio) and taxes, at both the corporate and individual level. Dhaliwal et al. (2006) provided evidence that cost of equity is negatively associated with corporate taxes but positively related to personal taxes. Ameer (2007) argued that the advantage provided by interest expense deduction diminishes after a certain point, and the additional financial risk associated with higher debt level outweighs the lower nominal cost of debt, thereby increasing cost of equity. When firm financial risk increases, cost of equity also increases. DE is defined as total debt divided by common equity.

(c) Earnings per Share, EPS (positive)

Earnings per share have similar effect as dividend yield on firm returns, according to Fama and French (1988). The use of dividend yield to forecast returns is not new, and can be found in the study of Rozeff (1984), Campbell and Shiller (1988), Fama and French (1988) and Campbell (1991), among others. Their findings are in accord with the intuition that stock prices are low relative to dividends when discount rates (cost of equity) and expected returns are high. Therefore, a positive relationship between earnings per share and cost of equity is expected. EPS is defined as earnings available for common stockholders divided by number of shares outstanding.

(d) Total Asset Turnover ratio, TAT (negative)

Ang et al. (2000) argued that asset turnover ratio measures the efficiency of management in utilizing assets. Firms with a higher asset turnover ratio have a lower cost of equity in the framework of Ang et al. (2000) since a higher ratio suggests lesser problems of managerial efficiency. Their findings are supported by Singh and Nejadmalayeri (2004) who indicated that managerial efficiency in utilization of firm resources has a constructive effect on cost of equity. TAT is defined as total sales divided by total assets.

2.3.2. Market-based variables

(a) Market-to-Book Ratio, MB (negative)

Fama and French (1993) showed that this ratio is an important valuation measure for explaining stock returns. The ratio may act as a proxy for distress risk factor since financially distressed firms are likely to have high book-to-market ratio. Gode and Mohanram (2003) also pointed out that higher book-to-market ratio reflects higher perceived risk. Ameer (2007) documented that book-to-market ratio is positively correlated to cost of equity. This study uses the market-to-book ratio available from Datastream. Following Guedhami and Mishra (2009), a negative relationship is expected. MB is defined as the market value of the ordinary (common) equity divided by the balance sheet value of the ordinary (common) equity.

(b) Firm Size, SIZE (negative)

The well-known effect of firm size on stock return variations is first embedded in Fama and French's (1993) three-factor model. They found that small firms have average returns higher than those of the large firms. This is not unexpected as larger firms tend to present less risk (Bloomfield and Michaely, 2004). Omran and Pointon (2004), Hail and Leuz (2006) and Sung *et al.* (2008) found a significant negative relationship between firm size and cost of equity. SIZE is defined as the natural logarithm of the market value of a firm's outstanding common stocks at the end of the year.

(c) Stock liquidity, SL (negative)

Stock liquidity is an important attribute since highly liquid stocks can be bought and sold with minimal impact on stock prices. On the contrary, an illiquid stock will increase cost of trading because of the difficulty to trade the stocks. The influence of trading costs on investors' required returns was examined by Amihud and Mendelson (1986), Brennan and Subrahmanyam (1996) and Jacoby *et al.* (2000). Their studies suggested a direct link between liquidity and cost of equity. Following Brennan *et al.* (1998) and Chordia *et al.* (2001), the natural logarithm of annual trading volume is used as the proxy for SL.

To investigate the determinants of cost of equity, the following panel model is used:

$$E(CE_{it}) = \alpha + \sum_{k=1}^{K} \beta^k X_{it}^k + \eta_i + \xi_t + \varepsilon_{it} \qquad (1a)$$

where $E(CE_{it})$ is the cost of equity calculated for firm *i, K* is the number of explanatory variables (which is seven), β^k is the regression coefficient for variable X^k, and ε_{it} is the error term. The firm (η_i) and period (ξ_t) effects are also considered in the model.

2.4. Data Description

This study covers the period from 3 January 2001 to 31 December 2008. Data were collected from Datastream which include the weekly prices of stocks listed on the Main Board of Bursa Malaysia as well as the market indices. The KLCI was used as proxy for the Malaysian market index while the MSCI US price index was used as proxy for the global market index.[7] Weekly frequency is preferable because daily series has more noise that may affect the quality of the cost of equity estimates.[8] The market model approach based on actual weekly market, global and firm returns was adopted to estimate risk measures in the study. Annual series of the variables used for exploring the determinants of cost of equity were also obtained from the DataStream database.

Costs of equity were calculated for every year in the sample period. Annual averages of the weekly 3-month Treasury bill rates of Malaysia and the U.S. were used to represent the local and global risk-free rates, respectively. Since different researchers adopted different approach and assumption in risk premium calculation, and there is no consensus on the values of the ex-ante local and global market risk premiums (Fernández, 2009) required for calculating cost of equity, this study adopted the estimates provided by Damodaran (http://pages.stern.nyu.edu/~adamodar/). The risk premium estimates obtained via Damodaran's approach are most widely used in the industry (Fernández, 2009).

To estimate long-term country risk premium, Damodaran started by referring to the country ratings by Moody's (www.moodys.com). A default spread for a country is computed by comparing the country's dollar-denominated bond to the U.S. Treasury bond rate. Other currencies denominated bonds such as the Euro or Yen can also be used as long as a corresponding risk-free rate (from a mature market) is available for computing the spread. The default rate is then multiplied with a global average of equity to bond market volatility of 1.5 to obtain the country risk premium. Finally, the market risk premium for a country is obtained by adding the country risk premium to the historical risk premium of the U.S. market. Hence, the Malaysian market risk premium was computed as the sum of the premium of a developed

[7] The MSCI US market index is used as otherwise global market risk premiums are not available for the calculation of cost of equity. All market risk premiums data were collected from Damodaran's website for consistency.

[8] For the weekly series, Wednesday closing prices were collected to avoid the Monday and Friday effects.

market (that is, the U.S. for this study) and Malaysia's country risk premium, which is available from Damodaran's website on annual basis from year 2001 to 2008. Given that global market risk premium is not available, the U.S. market risk premium was taken as the proxy. Since only annual risk premiums are available, the costs of equity were calculated on annual basis.

Costs of equity were calculated for firms from seven sectors of the Main Board in Bursa Malaysia. New firms which were listed after 2001 were filtered out because they do not have a complete series of data for the full sample period. A total of 354 firms are available for analysis. They are from Construction (28 firms), Consumer Products (54 firms), Industrial Products (129 firms), Plantation (21 firms), Properties (33 firms), Technology (12 firms) and Trading/Services (77 firms). The Finance sector is not included in the study because not all ratios are relevant performance measure for the financial institutions as they are for the other sectors. For example, a bank's financial healthiness is not evaluated so much by its cash flow and debt-to-equity ratio but its tier 1 capital ratio[9] and loan-to-deposit ratio. Mining is also excluded because only two firms passed the filtering process.

3. RESULTS AND DISCUSSION

Table 2 reports the R^2 and adjusted R^2 for the pooled regression of equation (10) based on the different risk measures. It appears that the R^2 and adjusted R^2 figures did not differ much between the LCAPM, GCAPM, 2F-CAPM and their downside counterparts. In all cases, the standard CAPM models had higher explanatory power than the downside models. It is also shown that the two-factor models had higher explanatory power than the models that consider only a single risk factor. Based on the goodness-of-fit, the semi-deviation approach ranked highest. This model explained more than 50% of the variations in stock returns. The implication is that the traditional modern finance approach of using the CAPM for calculating the cost of equity may yield lower accuracy. Practitioners should consider downside risk measures, and specifically the semi-deviation approach.

The correlation matrix for the pooled series of determinant variables as well as cost of equity is tabulated in Table 3. Overall, the variables were mildly correlated with pair-wise correlation coefficients of less than 0.53 in magnitude. Apart from the correlation between firm size and three other variables (earnings per share, market to book ratio and stock liquidity), the correlation coefficients in absolute value were 0.25 or less for all the other cases. Since the proposed determinant variables were not strongly correlated, all the variables were entered for the panel regression estimation.

The stationary properties of the variables were examined with four unit root tests under two different model settings, namely, model with intercept only, and model with intercept and trend. All the four tests have a null hypothesis of a unit root. The unit root test of Levin *et al.*

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[9] Tier 1 capital ratio is the core measure of a bank's strength from the viewpoint of a regulator. For laypeople, it is a measure of the bank's sustainability to future losses. For example, a 10% tier 1 capital measure means that for every RM10 deposited by customers, the bank is holding RM1 in its vaults or likewise locations.

(2002) is based on a common unit root in the cross-section units. The tests of Im *et al.* (2003) together with the ADF-Fisher and PP-Fisher tests proposed by Maddala and Wu (1999) and Choi (2001) respectively, allow each cross-section unit to have a varying unit root process. In Table 4, the results for the models with intercept only are reported in panel A, while the results for the models with intercept and trend are reported in panel B. For most part, the results did not indicate presence of unit roots. In panel A, all four tests consistently rejected the null hypothesis of unit root except for the unit root test of Im *et al.* (2003) on SIZE. In panel B, the unit root test of Im *et al.* (2003) failed to reject the null hypothesis in three cases (CR, TAT and SIZE), while the ADF Fisher test did not reject the null hypothesis for DE and TAT. Taking into consideration all the results of the different settings, at least six out of the eight tests performed on each series rejected the null hypothesis of a unit root. We therefore treated these panel series as stationary in level in the subsequent analysis.

Three panel regression models, namely, the pooled, fixed-effect and random-effect models, were estimated. The results are given in Table 5. The signs of the coefficients estimated from all three models were highly consistent. Most of the estimated coefficients from the three models were quite close in value. Both R^2 and adjusted R^2 suggested that all the models had reasonably good explanatory power on the cost of equity. The fixed-effect model had the strongest explanatory power and it explained about 60% of the variations in cost of equity. Five of the determinant variables were statistically significant at 1% in the fixed-effect model, while all of them were statistically significant at 1% for the pooled model. For the random-effect model, six statistically significant variables were found including EPS which was significant at the 5% level.

A series of diagnostic tests were performed to choose among the three panel models. First, the test for redundant fixed effect rejected the null hypothesis suggesting the superiority of a fixed-effect model over a simple pooled regression. The rejection of the null hypothesis in the Breusch-Pagan LM test showed that the random-effect model was preferred over the pooled model. To choose between the fixed- or random-effect models, the Hausman test rejected the null hypothesis of a random-effect model in favour of the fixed-effect specification, which was also the model with the best explanatory power.

From the fixed-effect model, the cost of equity was determined by DE, EPS, TAT, SIZE and SL. Consistent with the theory that higher debt is associated with increased financial risk, firms with higher DE are expected to have a higher cost of equity as indicated by the positive relationship between DE and COE. The sign for EPS was also as expected, indicating an increased cost of equity for firms with higher EPS. The negative coefficient for TAT suggested that firms with higher asset turnover ratio had lower cost of equity, thus supporting the framework of Ang *et al.* (2000). Managerial efficiency in utilizing firm resources seemed to have a desirable effect on the cost of equity. In line with the findings of Hail and Leuz (2006) and Chen *et al.* (2004), SIZE was negatively related to cost of equity. Our result supported the view that larger firms are able to gain economies of scale in raising funds and thus should have a lower cost of equity compared to smaller firms. The sign for the coefficient of SL, however, was inconsistent with expectation, as it revealed that firms with higher stock liquidity were associated with higher cost of equity. One possible explanation is that higher trading volume tends to be associated with higher volatility that may increase perceived risks of the firms (see for example, Dichev *et al.,* 2011).

Table 1: Summary of Equations for Cost of Equity and Models for Risk Measure

Equations for Cost of Equity		Models for Risk Measure	
LCAPM: $E(CE_i)=R_{lf}+\beta_i(R_{lM}-R_{lf})$	(2)	$r_{it}=\alpha_i+\beta_i r_{lMt}+\varepsilon_t$, where $\beta_i=\frac{cov(r_{it},r_{lMt})}{var(r_{lMt})}$	(2a)
GCAPM: $E(CE_i)=R_f^G+\beta_i^G(R_M^G-R_f^G)$	(3)	$r_{it}=\alpha_i^G+\beta_i^G r_{Mt}^G+\varepsilon_t$, where $\beta_i=\frac{cov(r_{it},r_{Mt}^G)}{var(r_{Mt}^G)}$	(3a)
2F-CAPM: $E(CE_i)=R_f+\beta_{Li}(R_{lM}-R_f)+\beta_{Gi}(R_M^G-R_f^G)$	(4)	$r_{it}=\alpha_i+\beta_{Li}r_{lMt}+\beta_{Gi}r_{Mt}^G+\varepsilon_t$	(4a)
		$\beta_{Li}=\frac{E(r_{Mt}^G)^2E(r_{it},r_{lMt})-E(r_{lMt},r_{Mt}^G)E(r_{it},r_{Mt}^G)}{E(r_{lMt})^2E(r_{Mt}^G)^2-[E(r_{lMt},r_{Mt}^G)]^2}$,	
		$\beta_{Gi}=\frac{E(r_{lMt})^2E(r_{it},r_{Mt}^G)-E(r_{lMt},r_{Mt}^G)E(r_{it},r_{lMt})}{E(r_{lMt})^2E(r_{Mt}^G)^2-[E(r_{lMt},r_{Mt}^G)]^2}$	
DLCAPM: $E(CE_i)=R_{lf}+\beta_i^D(R_{lM}-R_{lf})$	(5)	$r_{it}^D=\alpha_i^D+\beta_i^D r_{lMt}^D+\varepsilon_t$, where $\beta_i^D=\frac{cov(r_{it}^D,r_{lMt}^D)}{var(r_{lMt}^D)}$	(5a)
DGCAPM: $E(CE_i)=R_f^G+\beta_i^{DG}(R_M^G-R_f^G)$	(6)	$r_{it}^{DG}=\alpha_i^{DG}+\beta_i^{DG}r_{Mt}^{DG}+\varepsilon_t$, where $\beta_i^{DG}=\frac{cov(r_{it}^D,r_{Mt}^{DG})}{var(r_{Mt}^{DG})}$	(6a)
2F-DCAPM: $E(CE_i)=R_f+\beta_{Li}^D(R_{lM}-R_f)+\beta_{Gi}^D(R_M^G-R_f^G)$	(7)	$r_{it}^D=\alpha_i^D+\beta_{Li}^D(r_{lMt}^D)+\beta_{Gi}^D(r_{Mt}^{DG})+\varepsilon_t$	(7a)
		$\beta_{Li}^D=\frac{E[\min(r_{Mt}^G,0)]^2E[\min(r_{it},0)\min(r_{lMt},0)]-E[\min(r_{lMt},0)\min(r_{Mt}^G,0)]E[\min(r_{it},0)\min(r_{Mt}^G,0)]}{E[\min(r_{lMt},0)]^2E[\min(r_{Mt}^G,0)]^2-[E[\min(r_{lMt},0)\min(r_{Mt}^G,0)]]^2}$	
		$\beta_{Gi}^D=\frac{E[\min(r_{lMt},0)]^2E[\min(r_{it},0)\min(r_{Mt}^G,0)]-E[\min(r_{lMt},0)\min(r_{Mt}^G,0)]E[\min(r_{it},0)\min(r_{lMt},0)]}{E[\min(r_{lMt},0)]^2E[\min(r_{Mt}^G,0)]^2-[E[\min(r_{lMt},0)\min(r_{Mt}^G,0)]]^2}$	
Estrada's models:			
Standard Deviation $E(CE_i)=R_f+\sigma_i(R_m-R_f)$	(8)	$\sigma_i=\sqrt{\frac{1}{T}\sum_{t=1}^{T}(r_{it}-\bar{r}_i)^2}$	(8a)
Semi-Deviation $E(CE_i)=R_f+\delta_{B,i}(R_m-R_f)$	(9)	and	
		$\delta_{B,i}=\sqrt{\frac{1}{T}\sum_{t=1}^{T}(\min r_{it},0)^2}$	(9a)

Notes: LCAPM is local CAPM, GCAPM is global CAPM, 2F-CAPM is two-factor CAPM, DLCAPM is downside local CAPM, DGCAPM is downside global CAPM and 2F-DCAPM is two-factor downside CAPM.

Table 2: Goodness-of-Fit for Pooled Regression of Firm Returns on Risk Estimates

Model	R^2	Adjusted R^2
LCAPM	0.4936	0.4024
GCAPM	0.4992	0.4093
DLCAPM	0.4887	0.3967
DGCAPM	0.4939	0.4027
2FCAPM	0.5082	0.4146
2FDCAPM	0.4986	0.4027
SMSTD	0.5242	0.4385
STD	0.4961	0.4054

Notes: LCAPM is local CAPM, GCAPM is global CAPM, DLCAPM is downside local CAPM, DGCAPM is downside global CAPM, 2F-CAPM is two-factor CAPM, 2F-DCAPM is two-factor downside CAPM, SMSTD is semi-deviation and STD is standard deviation of returns.

Table 3: Correlation Matrix of Cost of Equity and Determinant Variables

	COE	CR	DE	EPS	TAT	MB	SIZE	SL
COE	1.0000							
CR	-0.1299	1.0000						
DE	0.1667	-0.2449	1.0000					
EPS	-0.2138	0.0325	-0.0600	1.0000				
TAT	-0.1537	-0.1427	0.0112	0.2317	1.0000			
MB	0.2470	-0.0632	-0.0420	-0.2450	-0.2309	1.0000		
SIZE	-0.4176	0.0323	-0.1018	0.4964	0.0003	-0.3710	1.0000	
SL	-0.0118	-0.0840	0.0230	0.0889	-0.1622	-0.1445	0.5284	1.0000

Notes: COE is cost of equity; CR is current assets divided by current liabilities; DE is total debt divided by common equity; EPS is earnings available for common stockholders divided by number of shares outstanding; TAT is total sales divided by total assets; MB is market value of the ordinary (common) equity divided by the balance sheet value of the ordinary (common) equity; SIZE is natural logarithm of market value of a firm's outstanding common stock at the end of each year; and SL is natural logarithm of annual trading volume.

Table 4: Unit Root Tests for Cost of Equity and Determinant Variables

Unit Root Test	COE	CR	DE	EPS	TAT	MB	SIZE	SL
Panel A: Model with Intercept								
Null: Common Unit Root								
Levin, Lin & Chu	-31.1745	-53.9969	-463.667	-484.688	-218.814	-12.8065	-15.2534	-33.4216
	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***
Null: Individual Unit Root								
Im, Pesaran and Shin	-10.2917	-7.83	-52.5862	-27.4722	-8.9582	-2.649	0.2263	-11.2711
	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0040)***	-0.5895	(0.0000)***
ADF - Fisher	1373.69	1127.81	1150.34	1068.02	912.704	989.395	812.349	1350.98
	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0039)***	(0.0000)***
PP - Fisher	1819.82	1111.09	1099.74	1242.96	880.452	1183.78	940.706	1894.94
	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***
Panel B: Model with Intercept and Trends								
Null: Common Unit Root								
Levin, Lin & Chu	-56.5789	-50.1411	-1167.56	-498.432	-34.0974	-53.2909	-39.1393	-51.5855
	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***
Null : Individual Unit Root								
Im, Pesaran and Shin W-stat	-4.0933	-0.7085	-26.4178	-11.0797	1.1788	-2.8383	-0.9284	-5.0849
	(0.0000)***	-0.2393	(0.0000)***	(0.0000)***	-0.8808	(0.0023)***	-0.1766	(0.0000)***
ADF - Fisher Chi-square	1197.05	836.457	718.858	950.787	696.13	1030.77	877.274	1246.78
	(0.0000)***	(0.0006)***	-0.1344	(0.0000)***	-0.6177	(0.0000)***	(0.0000)***	(0.0000)***
PP - Fisher Chi-square	2357.37	1395.51	1165.86	1555.73	1168.42	1832.88	1577.6	2304.7
	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***

Notes: Figures in the parentheses are p-values. *, ** and *** denote significance at the 0.10, 0.05 and 0.01 levels, respectively. For unit root tests that involve regressions on lagged difference terms (Levin, Lin and Chu; Im, Pesaran and Shin; and Fisher-ADF), the optimal lag length included in all the test equations is selected based on Schwarz information criterion. For the tests involving kernel weighting (Levin, Lin and Chu, and Fisher-PP), the Bartlett kernel is employed with Newey-West (Newey and West, 1987) selected bandwidth. Probabilities for the Fisher tests were computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality. See footnote to Table 3 for definition of the variables.

Table 5: Estimates of the Panel Models

Variable	Pooled	Fixed	Random
Constant	30.1458 (0.0000)***	33.1146 (0.0000)***	30.4557 (0.0000)***
CR	-0.2869 (0.0000)***	-0.1186 (0.1221)	-0.1930 (0.0012)***
DE	0.0102 (0.0000)***	0.0058 (0.0068)***	0.0084 (0.0000)***
EPS	4.7283 (0.0000)***	2.6426 (0.0092)***	2.0555 (0.0201)**
TAT	-2.9863 (0.0000)***	-2.0697 (0.0030)***	-2.7634 (0.0000)***
MB	0.7945 (0.0002)***	0.4292 (0.1740)	0.3467 (0.1196)
SIZE	-4.1657 (0.0000)***	-3.7520 (0.0000)***	-3.9895 (0.0000)***
SL	1.5777 (0.0000)***	1.0622 (0.0000)***	1.5279 (0.0000)***
No. of firms	354	354	354
No. of observations	2832	2832	2832
R^2	0.2754	0.6429	0.1859
Adjusted R^2	0.2736	0.5897	0.1839
Diagnostic Test			
Redundant Fixed Effect Test		7.0447 (0.0000)***	
Breusch and Pagan Lagrangian Multiplier Test			449.9300 (0.0000)***
Hausman Test for Random Effect			24.97261 (0.0008)***

Notes: Figures in the parentheses are p values. *, ** and *** denote significance at the 0.10, 0.05 and 0.01 levels, respectively. The p-value is based on panel robust standard errors. The random-effect model is based on Wallace and Hussain (1969). Redundant Fixed Effects test has the null hypothesis in favour of the pooled regression against the alternative hypothesis of fixed-effect model. Breusch and Pagan LM test has the null hypothesis in favour of the pooled regression against the alternative hypothesis of random-effect model. The Hausman test has the null hypothesis in favour of the random-effect model against the alternative hypothesis of the fixed-effect model.

4. CONCLUDING REMARKS

This study employs firm-level data for seven sectors which comprise of 354 firms listed in the Main Board of Bursa Malaysia covering the period 3 January 2001 to 31 December 2008 to find the most relevant method to calculate cost of equity for the Malaysian firms. The second part of the paper aims to investigate the effect of accounting- and market-based factors on cost of equity. Unlike previous studies where the model for estimating cost of equity was pre-determined, a few alternatives were considered in this study. Based on the explanatory power of panel regressions of firm returns on various risk measures, the semi-deviation approach yielded the best fit. This model explained more than 50% of the variations in stock.

The spatial dimensions as well as the time span dynamics of Malaysian firms were incorporated in panel models to investigate the potential determinants of cost of equity. Debt-to-equity ratio, earnings per share and stock liquidity had a significant positive impact on cost of equity, while total asset turnover ratio and firm size were statistically negative. Their signs were consistent with previous findings except for stock liquidity. Investors are therefore expecting a higher compensation for their capital investment for the increased financial risk they take from a higher debt-to-equity ratio and the possibility of lower future earnings given higher earnings per share. Firms with higher liquidity were expected to have higher cost of equity. As stock liquidity was measured by trading volume in this study, higher liquidity could imply higher return volatility induced by larger transactions which may increase perceived risk that demands a higher compensation to capital investment. On the other hand, the expected compensation is lower with better asset management efficiency as reflected by a higher total asset turnover, and firm stability associated with larger firm size.

Several firm-based implications are derived from the results of the study. First is related to the inappropriate use of standard cost of equity measures. Abdul Samad and Shaharuddin (2009) found CAPM to be a popular model among Malaysian firms for calculating cost of equity. Although they did not state which version of CAPM was preferred, it was mentioned that 54.2% of the firms understudied had costs of equity between 4 to 8%. These low estimates are good indication that standard risk measures were used in the calculation. The results from this study showed that downside risk measures had higher explanatory power on stock returns than standard risk measures. This finding is also supported by other studies on emerging markets, including Estrada (2000, 2001, 2002, 2007), Chen and Chen (2004), Collins and Abrahamson (2006) and Pedersen and Hwang (2007). Hence, standard risk measures are most likely to underestimate cost of equity, and decisions from using such estimates could lead to inappropriate investment choices detrimental to firm value.

Second is on the importance of firm growth. The growth maximization framework of Marris (1967) proposed that the realization of managerial utility function (with salary, job security and power as key variables) would depend on the size of the firm. Therefore, managers have a larger tendency to maximize firm growth than profits. The results of our study showed that there is another benefit from maximizing firm growth. Larger firms are associated with lower cost of equity, since they are usually in a better position to raise external funds on favourable terms. The benefit of acquiring funds at lower costs is that, *ceteris paribus,* better ability to achieve higher profits for the firm. While managers are maximizing firm growth, they are also generating greater profit potentials. For this reason, constant communication with stockholders and making known of firm growth strategies is essential to attract investors.

One shortcoming of the models adopted in this study is the underlying assumption that the volatility of equity returns at the firm level remains constant. Although practically appealing, the CAPM-based approach and the model of Estrada are methodologically contested given that return volatilities have been empirically shown to be time-varying. Research effort in the future should be directed to explore for models that retain practicality without compromising statistical precision by taking time-varying properties into consideration.

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