Determinants of Sectoral Cost of Equity for an Emerging Market: The Case of Malaysian Firms

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Abstract: The use of capital asset pricing model (CAPM) in measuring cost of equity for emerging markets with the assumptions that the markets are either fully integrated or completely segmented has come under question. Among them, Harvey (1995) and Erb *et al.* (1996) found no significant relation between standard CAPM's beta with expected returns. Hence, the current study proposes modifications to the CAPM so that the characteristic of partial integration of emerging markets into the world market is better reflected in the model. The downside risks proposed by Estrada (2000) were also considered. Annual estimates of cost of equity were obtained for 354 firms categorised into seven sectors in the stock exchange for the period 2001-2008. The results showed that the downside risk of the semi-deviation approach provides the most relevant measure for calculating cost of equity. In the second part of this study, semi-deviation estimates were employed to investigate determinants of cost of equity. Pooled, fixed-effect, random-effect, and dynamic difference- and system-GMM panel models were considered. The results showed that the determinants of cost of equity are not necessarily the same across different sectors, thereby highlighting the importance of sectoral analysis. Several implications were derived from the results of this study.

Keywords: Sectoral cost of equity, determinant, downside risk, CAPM, emerging market
JEL classification: G32

1. Introduction

Cost of equity is one of the two key components in estimating a firm's cost of capital (the other is cost of debt). Accurate estimation of the cost of capital is crucial for making financial decisions such as capital structure choice, capital budgeting analysis, performance assessment, and firm valuation. As one of the key components, the cost of equity is a significant input and its accuracy will have an effect on accuracy of estimation of the firm's cost of capital. The use of an incorrect cost of equity estimate can have serious consequences. For example, firms may lose market share to competitors when overestimated cost of equity leads to rejection of promising investment opportunities. On the other hand, underestimated cost of equity may cause value-destructive investments to be accepted, thus causing the firm to lose market value. In a nutshell, the consequence from applying less appropriate models to estimate cost of equity can be detrimental.

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The introduction of an exposure draft entitled 'Fair Value Measurement' by the International Accounting Standards Board (IASB) in May 2009 uplifted the perspective on fair value measurement, in particular, how fair value should be measured and the requirement for reporting firms to disclose their fair value measurements. Once enacted as part of the International Financial Reporting Standard (IFRS), Malaysia will have to adopt the framework outlined in IFRS. In fact, the Malaysian Accounting Standards Board (MASB) has issued a statement on its plan to achieve full convergence of Malaysia's Financial Reporting Standards with IFRS by 1st January 2012. In other words, all public listed firms in Malaysia will need to adhere to the framework outlined in IFRS in measuring fair value as well as disclosing the fair value measurements. Even though the draft does not prescribe the use of a specific valuation technique, it is mentioned in Appendix C on present value technique under C15 that the capital asset pricing model (CAPM) can be used to estimate the discount rate. Empirical evidence suggests that the use of the CAPM to estimate discount rate or cost of equity is widespread among practitioners, see for example, Bruner *et al*. (1998) and Graham and Harvey (2001) for the US; Al-Ali and Arkwright (2000), Arnold and Hatzopoulos (2000) and McLaney *et al.* (2004) for the UK; Truong *et al.* (2008) for Australia; Correia and Cramer (2008) for South Africa; and Abdul Samad and Shaharuddin (2009) for Malaysia Therefore, an increase in the use of the CAPM among Malaysian firms could be expected.

Although the CAPM receives widespread popularity in the corporate world, there is no consensus in academic literature as to which CAPM variants can offer the best model for estimating cost of equity at firm level. There seems to be a general rule of thumb that the local CAPM (LCAPM) should be used when appraisers believe that markets are segmented and to use the global CAPM (GCAPM) if the appraisers believe that markets are fully integrated. Pereiro (2006) provided a list of asset pricing models for emerging markets. Among them were Lessard's (1996) model where country risk premium is added; Godfrey and Espinosa's (1996) model where a correction factor is added to adjust for double counting the country risk premium; Pereiro's (2001) adjusted hybrid CAPM which is an improvement of the Godfrey and Espinosa's (1996) model; and Estrada's (2000; 2001) non-CAPM based model where he argued that cost of equity estimates based on downside risks are more suitable for emerging markets. However, none of the studies in the list provided by Pereiro (2006) considers both local and global factors simultaneously. With the onset of capital market liberalisation in the 1990s, some emerging markets have become partially integrated into the world capital market (Bekaert and Harvey 1995; Bekaert *et al*. 2005). If Malaysia is partially integrated into the world capital market, then a model which considers both local and global factors might offer greater explanatory power on stock returns of firms. Hence, better cost of equity estimates could be obtained. The first focus of this research is to attend to the above research gap, that is, to examine which asset pricing model provides the best fit for calculating the cost of equity for Malaysian firms.

Malaysia has a very diverse economic structure. Thus, cost of equity estimates could be distinct from one sector to another. Indeed, Collins and Abrahamson (2006) and Hearn and Piesse (2009) observed a wide dispersion in cost of equity estimates across sectors. Hardouvelis *et al.* (2007) revealed strong convergence in the cost of equity across the member countries of the European Union (EU) within a given industrial sector, but little convergence across the different sectors of a given EU country. The implication for portfolio managers is that sectoral effects are becoming more important. Although research on cost of equity estimation is somewhat well established, studies that examine determinants of cost of equity in the literature are still lacking, in particular at the sectoral level. In most studies, the exploration for determinants is not the core objective, but a peripheral product of the analysis on the impact of different factors such as financial liberalisation (Ameer 2007), liquidity (Lin *et al.* 2009), earnings forecast (Rakow 2010), and corporate governance (Chen *et al.* 2009; Guedhami and Mishra 2009) on cost of equity. A few studies that focused on examining the determinants are Omran and Pointon (2004) and Sung *et al.* (2008). Given the importance of accuracy in estimating cost of equity, an exploration of the determinants of cost of equity would assist firms in making effective strategic decisions and better performance evaluation. In the present study, seven possible determinants are examined using firm-level data. They are current ratio (CR), debt-to-equity ratio (DE), earnings per share (EPS), total asset turnover ratio (TAT), market-to-book ratio (MB), firm size (SIZE) and stock liquidity (SL).

Our empirical results highlight a few important points. First, measures of cost of equity could be improved when taking downside risk into consideration. Second, it turns out that firm size is an important determinant for most sectors. The results show that the determinants of cost of equity vary across different sectors, thus highlighting the importance of sectoral analysis. Several policy implications are derived from the results of this study.

2. Methodology and Data

2.1 Cost of Equity Model

Based on modern asset pricing theory, cost of equity can be estimated from two sources: risk-free rate and a premium for exposure to systematic risk:

Cost of Equity = Risk-Free Rate + [Risk Measure x Market Risk Premium] (1)

The above equation states that the equity investor requires at least a return of risk free rate plus a risk premium that is benchmarked to the market risk premium, depending on the riskiness or risk measure of the firm. Modern asset pricing theory also shows that investors are concerned only about systematic risk as they should be able to diversify away firm specific risk in their portfolio holdings.

2.2 The Various Risk Measures

The most basic and common way of estimating a firm's systematic risk is based on CAPM derived by Sharpe (1964), Lintner (1965) and Mossin (1966). Early research in the 1970s assumed that the benchmark portfolio is the local market portfolio as during those days, the international capital market was very segmented. Hence, the local market index and the domestic risk-free rate were used to estimate systematic risk. This setting has later been referred to as local CAPM in contemporary studies. With the collapse of the Bretton Wood exchange rate system in 1973, the liberalisation and globalisation of the world's financial system have progressed rapidly since the 1980s. Capital markets across national borders are closely linked with the use of information technology, especially personal computers, the World Wide Web and the Internet in the 1990s. These developments have promoted the integration of equity markets. In other words, a standardisation of risk pricing across markets. Given this scenario in the recent decades, most researchers agree that a global CAPM is more relevant because the equity premium should command the same returns when it is measured in the same unit of risk, no matter where the investment is held. The risk measure for firms should thus be captured by its global systematic risk exposure.[1]

A single global capital market may be too ideal. Moreover, empirical evidence has falsified this assumption as there is no single source of systematic risk for explaining variation of returns across countries (see Harvey 1991). Hence, we propose a two-factor model which introduces a global market factor into the local CAPM, hereafter denoted as 2F-CAPM. The 2F-CAPM includes both types of premium, one for the stock's exposure to the return on the local market portfolio and another for the exposure to the return on the global market portfolio. Therefore, the model captures the sensitivity of a firm's returns not only to local market movements, but also to the global market movements. Models based on downside risk measures were also considered in this study. According to Estrada (2002) and Chen and Chen (2004), the standard risk measure seems too small to reflect costs of equity that investors would deem as reasonable. They found downside risk measures to have a higher explanatory power over stock returns in emerging markets.

Taking the above findings into consideration, this study compared the list of risk measures that are based on different assumptions to calculate the cost of equity for Malaysian firms.

Local CAPM (LCAPM): $$r_{it} = \alpha_i + \beta_i r_{Mt} + \varepsilon_t \quad \text{where } \beta_i = \frac{\text{cov}(r_{it}, r_{Mt})}{\text{var}(r_{Mt})} \tag{2}$$

Global CAPM (GCAPM): $$r_{it} = \alpha_i^G + \beta_i^G r_{Mt}^G + \varepsilon_t \quad \text{where } \beta_i = \frac{\text{cov}(r_{it}, r_{Mt}^G)}{\text{var}(r_{Mt}^G)} \tag{3}$$

2-factor CAPM (2F-CAPM): $$r_{it} = \alpha_i + \beta_{Li} r_{Mt} + \beta_{Gi} r_{Mt}^G + \varepsilon_t \tag{4}$$

where $$\beta_{Li} = \frac{E(r_{Mt}^G)^2 E(r_{it}, r_{Mt}) - E(r_{Mt}, r_{Mt}^G) E(r_{it}, r_{Mt}^G)}{E(r_{Mt})^2 E(r_{Mt}^G)^2 - [E(r_{Mt}, r_{Mt}^G)]^2},$$

$$\beta_{Gi} = \frac{E(r_{Mt})^2 E(r_{it}, r_{Mt}^G) - E(r_{Mt}, r_{Mt}^G) E(r_{it}, r_{Mt})}{E(r_{Mt})^2 E(r_{Mt}^G)^2 - [E(r_{Mt}, r_{Mt}^G)]^2}$$

[1] Stulz (1995) believes that the progressive integration of world's 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.

In the above, r_{it} is the excess return for firm *i*; r_{Mt} and r_{Mt}^{G} are the excess return for local market portfolio and global market portfolio, respectively. The estimated coefficient β_i in each model is the risk measure based on the respective model and is collected to calculate the cost of equity in Eq. (1).

For the downside risk versions of the above models, the risk measure is replaced with downside beta, estimated when the firm, market and global returns are $r_{it}^{D} = \min(r_{it},0)$, $r_{Mt}^{D} = \min(r_{Mt},0)$ and $r_{Mt}^{DG} = \min(r_{Mt}^{G},0)$, respectively.[2]

Downside CAPM (DCAPM): $r_{it}^{D} = \alpha_i^{D} + \beta_i^{D} r_{Mt}^{D} + \varepsilon_t$ where $\beta_i^{D} = \frac{\operatorname{cov}\left(r_{it}^{D}, r_{Mt}^{D}\right)}{\operatorname{var}\left(r_{Mt}^{D}\right)}$ (5)

Downside GCAPM: $r_{it}^{DG} = \alpha_i^{DG} + \beta_i^{DG} r_{Mt}^{DG} + \varepsilon_t$ where $\beta_i^{DG} = \frac{\operatorname{cov}\left(r_{it}^{D}, r_{Mt}^{DG}\right)}{\operatorname{var}\left(r_{Mt}^{DG}\right)}$ (6)

Downside 2F-GCAPM $r_{it}^{D} = \alpha_i^{D} + \beta_{Li}^{D}\left(r_{Mt}^{D}\right) + \beta_{Gi}^{D}\left(r_{Mt}^{DG}\right) + \varepsilon_t$ (7)

where $$\beta_{Li}^{D} = \frac{E\left[\min\left(r_{Mt}^{G},0\right)\right]^2 E\left[\min\left(r_{it},0\right)\min\left(r_{Mt},0\right)\right] - E\left[\min\left(r_{Mt},0\right)\min\left(r_{Mt}^{G},0\right)\right]E\left[\min\left(r_{it},0\right)\min\left(r_{Mt}^{G},0\right)\right]}{E\left[\min\left(r_{Mt},0\right)\right]^2 E\left[\min\left(r_{Mt}^{G},0\right)\right]^2 - E\left[\min\left(r_{Mt},0\right)\min\left(r_{Mt}^{G},0\right)\right]^2}$$

$$r_{it}^{D} = \min(r_{it},0)\beta_{Gi}^{D} = \frac{E\left[\min\left(r_{Mt},0\right)\right]^2 E\left[\min\left(r_{it},0\right)\min\left(r_{Mt}^{G},0\right)\right] - E\left[\min\left(r_{Mt},0\right)\min\left(r_{Mt}^{G},0\right)\right]E\left[\min\left(r_{it},0\right)\min\left(r_{Mt},0\right)\right]}{E\left[\min\left(r_{Mt},0\right)\right]^2 E\left[\min\left(r_{Mt}^{G},0\right)\right]^2 - E\left[\min\left(r_{Mt},0\right)\min\left(r_{Mt}^{G},0\right)\right]^2}$$

Apart from the above six risk measures, we also included two risk measures, which are the total risk and total downside risk, given as follows:

$$\sigma_{\mathrm{i}} = \sqrt{\frac{1}{\mathrm{T}}\sum_{t=1}^{T}\left(r_{it} - \overline{r_i}\right)^2} \tag{8}$$

$$\delta_{R_{ft},i} = \sqrt{\frac{1}{\mathrm{T}}\sum_{t=1}^{T}\left(\min r_{it},0\right)^2} \tag{9}$$

[2] Chen and Chen (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's relative performance.

From the eight risk measures proposed for the calculation of cost of equity, we need to find one risk measure that gives the best fit in the calculation of cost of equity. Following Estrada (2000; 2001; 2002) and Chen and Chen (2004), we used actual stock returns to proxy for ex-post cost of equity and estimate the following pooled regression to compare which of the risk measures best explain the ex-post cost of equity:

$$r_{it} = \gamma_0 + \gamma_1 \beta_{it}^{panel} + \varepsilon_{it} \quad (10)$$

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 actual firm stock returns, and β_{it}^{panel} is the stack series of the risk measure estimated. Equation (10) is estimated for all the eight different risk measures and the R^2 and adjusted R^2 is referred.

2.3 Cost of Equity Calculation

The costs of equity were calculated for every year in the sample period. The 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. Different researchers have adopted different approaches and assumptions 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. We adopted the estimates provided by Damodaran (*http://pages.stern.nyu.edu/~adamodar/*) given that they are most widely applied in the industry (Fernández 2009). In the estimation of the long-term country risk premium, Damodaran (2010) 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.[3] This default rate is then multiplied with a global average of equity to bond market volatility of 1.5 to obtain the country's equity risk premium. The market risk premium for a country is then obtained by adding the country risk premium to the historical risk premium of a mature market, in this case, the U.S. market.

Following Damodaran (2010), the sovereign bond premium approach was adopted to overcome the problem associated with the estimation of market risk premium for emerging markets. Accordingly, the Malaysian market risk premium was computed as the sum of the premium of a developed market (that is, the U.S. for this study) and Malaysia's country risk premium, which is available from Damodaran's website on an annual basis from year 2001 to 2008. Since global market risk premium is not available, the U.S. market risk premium was taken as the proxy. Given that only annual risk premiums are available, the costs of equity were calculated on an annual basis in this paper.

2.4 Determinants of Cost of Equity

We proceed to investigate the determinants of cost of equity calculated from the model with the best fit in a panel regression framework:

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[3] Other currency-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.

$$E(CE_{it}) = \alpha + \sum_{k=1}^{K} \beta^k X_{it}^k + \eta_i + \xi_t + \varepsilon_{it} \quad (11)$$

where $E(CE_{it})$ is the cost of equity calculated for firm i based on the best fitted risk measure, K is the number of determinant variables, β^k is the regression coefficient for determinant X^k and ε_{it} is the error term. The firm (η_i) and period (ξ_t) effects are also included in the model.

Various firm financial ratios have been shown to provide explanatory power on the firm's cost of equity (see for example, Gebhardt *et al*. 2001; Omran and Pointon 2004; Ameer 2007; Sung *et al.* 2008; Guedhami and Mishra 2009). The financial ratios of a firm can be 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. In addition, two other variables of firm size and stock liquidity are also included in the analysis. Following Omran and Pointon (2004) and Sung *et al.* (2008), we divided the explanatory variables into accounting-based and market-based.

We have four accounting-based variables, namely, current ratio (CR), debt-to-equity ratio (DE), earnings per share (EPS) and total asset turnover ratio (TAT). CR is given as total current assets divided by total current liabilities. It measures a firm's ability to fulfil short-term obligations. Omran and Pointon (2004) found current ratio to be negatively related to cost of equity. DE measures total debt divided by common equity. It is the amount of a firm's debt financing in relation to its equity financing. Ameer (2007) argued that the advantage provided by interest expense deduction diminishes after a certain point, and the additional financial risk associated with a higher debt level outweighs the lower nominal cost of debt, thereby increasing cost of equity. When a firm's financial risk increases, cost of equity also increases. EPS is defined as earnings available for common stockholders divided by number of shares outstanding. According to Fama and French (1988), EPS has a similar effect as dividend yield on firm returns. Hence, a positive relationship between EPS and cost of equity is expected. TAT measures the efficiency of management in utilising assets and is given as total sales divided by total assets. Singh and Nejadmalayeri (2004) found managerial efficiency in utilising firm resources to have a constructive effect on cost of equity. Therefore, TAT is expected to have a positive relationship with cost of equity.

Three explanatory variables are categorised under market-based variables. They are market-to-book ratio (MB), firm size (SIZE) and stock liquidity (SL). MB is measured as the market value of common equity divided by the balance sheet value of the common equity. Higher book-to-market ratio reflects higher perceived risk (Gode and Mohanram 2003). Therefore, book-to-market ratio is positively related to cost of equity as evidenced in the study of Ameer (2007). Since this study uses MB, following Guedhami and Mishra (2009), a negative relationship between MB and cost of equity is expected. SIZE is defined as the natural logarithm of the market value of a firm's outstanding common stocks at the end of the year. Small firms are found to exhibit average returns that are higher than those of the large firms (Fama and French, 1993) as large firms tend to present less risk (Bloomfield and Michaely 2004). Hence, a negative relationship between SIZE and cost of equity is expected. Last but not least, SL is given as the natural logarithm of annual trading volume. SL is an important attribute because stocks with high liquidity can be bought and sold with minimal impact on stock prices. It is found to have a direct link with cost of equity (see for example, Amihud and Mendelson 1986; Brennan and Subrahmanyam 1996; Jacoby *et al*. 2000). A negative relationship between SL and cost of equity is expected.

2.5 Data Description

The sample for this study covers the period from 3 January 2001 to 31 December 2008. All data were collected from DataStream. They 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 and the MSCI US price index for the global market index.[4] Weekly frequency is preferable because daily series has more noise that may affect the quality of the cost of equity estimates.[5] The market model approach based on actual weekly global, market and firm returns was adopted to estimate the risk measures in this study.

Costs of equity were calculated for firms from seven sectors of the Main Board in Bursa Malaysia. After filtering out new firms which were listed after 2001 because they do not have a complete series of data for the full sample period, we had a total of 354 firms available for analysis. They were 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 was excluded because not all ratios considered in this study were relevant performance measures for the financial institutions as they were for the other sectors. For example, a bank's financial healthiness is not gauged so much by its cash flow and debt-to-equity ratio but by its tier 1 capital ratio and loan-to-deposit ratio.[6] Mining was also excluded because only two firms passed the filtering process.

The variables used for exploring the determinants of cost of equity were also obtained from the DataStream database. As this database compiles information from the annual reports of the firms listed in Bursa Malaysia, only yearly observations of the accounting- and market-based variables are available for analysis.

3. Results and Discussion

3.1 Measures of Equity Cost

Table 1 shows the average firm stock returns, market returns, risk-free rates and market risk premiums for the period 2001-2008. The negative average returns for the Malaysian market as well as some of its sectors in 2001 and 2002 could be related to the Dot.Com bubble burst. The Plantations sector was sheltered from the adverse impact of the bubble burst and was

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[4] 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.

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

[6] 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.

Table 1. Firm returns, risk-free rates and the market risk premiums (in %)

Year	(No. of Firms)	2001	2002	2003	2004	2005	2006	2007	2008	Grand mean
Average annual firm return										
Construction	(28)	4.70	-18.53	36.55	-28.31	-39.13	32.51	46.11	-63.11	-3.65
Consumer products	(54)	0.46	-15.61	14.21	-3.89	-9.38	8.42	7.89	-31.05	-3.62
Industrial products	(129)	-2.97	-16.59	31.00	-10.06	-38.54	20.19	10.61	-46.30	-6.58
Plantations	(21)	9.29	10.56	16.07	10.16	-4.37	28.69	55.75	-48.51	9.71
Properties	(33)	-4.07	-23.22	27.96	-7.61	-39.69	28.39	45.69	-70.17	-5.34
Technology	(12)	2.09	-18.09	29.76	-32.08	-47.46	11.31	-6.15	-53.61	-14.28
Trading/Services	(77)	-3.62	-17.49	26.66	-3.11	-22.92	20.73	19.33	-52.38	-4.10
Average annual market return										
KLCI		-3.79	-3.52	21.37	15.49	-0.86	19.13	28.00	-45.88	3.74
MSCI US		-9.88	-26.21	22.19	10.14	4.75	11.84	5.58	-47.65	-3.66
Annual risk-free rate										
Local		4.78	3.66	2.46	2.82	4.57	6.12	5.75	4.05	4.28
Global (US)		3.48	1.64	1.03	1.39	3.22	4.85	4.48	1.42	2.69
Ex-ante annual market risk Premium										
Local		6.81	6.54	6.25	6.27	6.15	6.19	6.07	7.63	6.49
Global (US)		5.51	4.51	4.82	4.84	4.80	4.91	4.79	5.00	4.90

Note: The returns were computed on the basis of U.S. dollars.

the only sector with a positive average return in 2002. Nevertheless, in 2003, the market recovered temporarily and the average returns for most sectors outperformed the market. In 2004 and 2005, average returns deteriorated. The majority of the average sectoral returns turned negative. The market showed major improvements in 2006 with positive returns that peaked in 2007. The KLCI recorded a positive average return of 28 per cent while the average sectoral return went up to as high as 55.75 per cent. The U.S. subprime crisis finally took its toll on the Malaysian market where large negative returns were recorded in 2008. On the other hand, local and global annual risk-free rates were relatively more stable with averages of 4.28 per cent and 2.69 per cent respectively. The annual market risk premiums for Malaysia were between 6.07 to 7.63 per cent while the global market risk premium fluctuated within a narrower range of 4.51 to 5.51 per cent on average.

Table 2 reports the annual average of risk measures for firms in the Construction, Consumer Products, Industrial Products, Plantations, Properties, Technology and Trading/ Services sectors, respectively. In general, there are consistencies in results across the seven sectors on two aspects. First, larger risk measures were found based on total risk and downside risk than those based on systematic risk. This observation is in accord with Estrada's (2000, 2001) findings. Second, the local market has a more dominant influence than the global market on stock returns in Malaysia. Estimated local betas are roughly three times higher than the estimates of global betas, suggesting firm returns are more responsive to the variations in the local market than to the global market movements.

The estimated β_i for four out of seven sectors have average figures of greater than one. The sectors are Construction (1.1643), Properties (1.3048), Technology (1.0549), and Trading/ Services (1.0255). It also means that they have higher risk exposure than the market, with the Properties sector attaining the highest β_i values. The other three sectors, Consumer Products, Industrial Products, and Plantations, have lower average β_i of 0.7842, 0.9918 and 0.9820, respectively. On the contrary, β_i^G estimates are less than 0.5, suggesting that firm stock returns are less responsive to global market returns. Estimated downside betas have been consistently above one. When the local and global betas were jointly estimated in the two-factor model, β_{Li} ends up with average values greater than β_{Gi}. This is also true for its downside version. This finding is consistent with the one-factor model. The average of the estimates of local betas from the two-factor model does not differ much from that of the one-factor model but this is not the case for global betas. The figure of β_{Gi} from the two-factor model is much lower than β_i^G from the one-factor model. Bodnar *et al*. (2003) addressed this observation as the phenomenon of 'local pricing', whereby, for unknown reasons, local stock indices have a dominant influence on the securities traded on the local stock exchange when applying a hybrid CAPM.

The R^2 and adjusted R^2 for the pooled regression of equation (10) based on the different risk measures by sectors are presented in Table 3. It appears that there is only a small difference in the R^2 and adjusted R^2 figures between the LCAPM, GCAPM, 2F-CAPM and their downside counterparts. In most cases, the standard CAPM models have slightly higher explanatory power than the downside models. It is also revealed in four out of seven sectors that the two-factor models have higher explanatory power than the models that consider only one risk factor. Based on the goodness-of-fit, the semi-deviation approach ranked highest. This model explains about 40 per cent of the variations in stock returns and

Table 2. Average of the firm risk measures by sector

Risk measure	Construction	Consumer products	Industrial products	Plantations	Properties	Technology	Trading/services	Grand mean
β_i	1.1643	0.7842	0.9918	0.9820	1.3048	1.0549	1.0255	1.0439
β_i^G	0.4170	0.2063	0.2928	0.2926	0.4087	0.4725	0.2867	0.3395
β_i^D	1.8102	1.3700	1.7002	1.4531	1.8984	1.6803	1.5587	1.6387
β_i^{DG}	1.4196	1.0066	1.3140	1.0243	1.4092	1.2780	1.2042	1.2366
β_{Li}	1.1365	0.7870	0.9908	0.9820	1.3000	0.9937	1.0262	1.0309
β_{Gi}	0.0732	-0.0142	0.0008	-0.0016	0.0192	0.1891	-0.0097	0.0367
β_{Li}^D	1.4405	1.0553	1.3793	1.1526	1.6101	1.3147	1.2078	1.3086
β_{Gi}^D	0.6910	0.4970	0.6328	0.4401	0.6457	0.6725	0.5909	0.5957
$\delta_{R_{ft}},_i$	4.2862	3.4668	4.2608	3.2466	4.5511	3.9804	3.8352	3.9467
σ_i	6.2906	5.0177	6.2079	4.9667	6.7582	5.7271	5.6688	5.8053

Notes: The risk measures are as depicted in equations (2), (3), (4), (5), (6), (7), (8) and (9). The figures in the table are obtained by taking the average of the yearly estimates.

Table 3. Goodness-of-fit for pooled regression of firm returns on risk estimates

Model	Construction	Consumer products	Industrial products	Plantations	Properties	Technology	Trading/Services	Grand mean
Panel A: R^2								
LCAPM	0.5853	0.3086	0.4109	0.6589	0.5565	0.5532	0.3819	0.4936
GCAPM	0.5735	0.3032	0.4118	0.6560	0.5814	0.5815	0.3873	0.4992
DLCAPM	0.5753	0.3008	0.4088	0.6552	0.5550	0.5523	0.3738	0.4887
DGCAPM	0.5744	0.3008	0.4131	0.6679	0.5527	0.5537	0.3946	0.4939
2FCAPM	0.5973	0.3322	0.4132	0.6591	0.5732	0.5958	0.3865	0.5082
2FDCAPM	0.5968	0.3135	0.4179	0.6611	0.5608	0.5564	0.3838	0.4986
SMSTD	0.6148	0.3735	0.4290	0.6646	0.5692	0.5917	0.4263	0.5242
STD	0.5741	0.3007	0.4249	0.6804	0.5634	0.5522	0.3771	0.4961
Panel B: Adjusted R^2								
LCAPM	0.5081	0.1946	0.3214	0.5902	0.4769	0.4415	0.2842	0.4024
GCAPM	0.4941	0.1883	0.3224	0.5867	0.5063	0.4769	0.2904	0.4093
DLCAPM	0.4962	0.1855	0.3189	0.5858	0.4752	0.4404	0.2747	0.3967
DGCAPM	0.4951	0.1856	0.3239	0.6010	0.4725	0.4422	0.2988	0.4027
2F-CAPM	0.5172	0.2179	0.3225	0.5845	0.4920	0.4811	0.2868	0.4146
2F-DCAPM	0.5165	0.1960	0.3279	0.5869	0.4773	0.4305	0.2837	0.4027
SMSTD	0.5431	0.2702	0.3423	0.5970	0.4920	0.4896	0.3355	0.4385
STD	0.4948	0.1854	0.3375	0.6160	0.4851	0.4402	0.2785	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.

the figure went up to more than 50 per cent for some sectors. 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 therefore consider downside risk measures, particularly the semi-deviation approach.

Before proceeding to the determinant of cost of equity analysis, we examined the costs of equity estimated from SMSTD across the various sectors as shown in Table 4. Basically, declining cost of equity is observed from year 2001 to 2004 across sectors. This finding is consistent with Ameer (2007) whereby, using the sample period from 1990 to 2004, he recorded a declining pattern in his cost of equity estimates for Malaysia. The cost of equity figures for all the sectors in 2004 were reduced by least one-third of their respective figures in 2001. Nonetheless, after 2004, the costs of equity seem to be constantly on the rise and the trend continued into 2008. For the Construction, Industrial Products, Plantations, Properties and the Technology sectors, their costs of equity in 2008 were the highest during the sample period. More often than not, the Properties sector was documented to have the highest average cost of equity. Rising cost of building materials during the sample period could have contributed to the high cost of equity. For example, the price of cement was revised at the end of 2006. Further, the price of steel bars was revised upwards three times in the months of April, June and December of 2007 by a total of 45 per cent. On the other hand, the Plantations sector showed the lowest average cost of equity. As Malaysia does not experience dramatic climate changes throughout the year, harvests are relatively stable. The only factor that might have a significant impact on the Plantations sector is changes in global commodity prices. Therefore, the sector appears as the least risky sector amongst all.

3.2 Determinants of Equity Cost

First, the strength of the linear relationship between all the determinant variables was checked for potential occurrence of multicollinearity.[7] Overall, the variables did not display extremely strong correlation, that is, all the pair-wise correlation coefficients were less than 0.7 in magnitude. The absolute value of 0.7 is the standard threshold proposed in many textbooks in statistics to imply strong correlation (weak correlation will be below 0.3). In fact, a vast majority of the absolute correlation coefficients between the determinant variables tabulated were actually below 0.5, which is the threshold value used by Omran and Pointon (2004) to avoid the multicollinearity problem in their study on the determinants for cost of equity in Egypt. Since none of the pairs of proposed determinant variables had a correlation coefficient above 0.7 in magnitude, all the variables were retained in the panel regression estimations for all the sectors.

Next, 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 had a null hypothesis of a unit root. The unit root test of Levin *et al.* (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, allowed for each cross-section unit to have a varying unit root process.[8] For most part, the results did not indicate presence of unit roots.

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[7] Results are not presented here to conserve space but are available upon request.
[8] Results are available upon request.

Table 4. Cost of equity calculated using the SMSTD model

Year	Construction	Consumer products	Industrial products	Plantations	Properties	Technology	Trading/Services
2001	32.9946	28.2023	33.3705	28.3543	35.1133	32.7575	32.6290
2002	20.2436	17.0968	19.8838	16.5135	22.0601	19.4465	19.6954
2003	20.1012	18.4532	20.6986	16.2382	23.4510	17.5384	19.4346
2004	20.7443	17.2148	19.0394	17.3578	19.4726	17.0894	17.7139
2005	22.8013	19.7845	24.2919	15.9287	25.6963	20.1718	20.9780
2006	23.4835	22.1865	24.2879	17.4613	24.4814	27.0316	21.5440
2007	25.8758	20.8183	26.8555	19.5774	27.3170	23.6117	23.4556
2008	37.0162	27.1760	33.8079	31.1495	35.9784	33.8085	30.1382
Grand mean	25.4076	21.3666	25.2794	20.3226	26.6963	23.9319	23.1986

We can conclude that the panel series of each of the sectors was stationary at level, and they can be treated as I(0) series. The results allowed for the use of variables in level for the panel regression analysis at the sectoral level.

Three different settings from static panel models, that is, pooled, fixed-effect and random-effect models and two dynamic panel models, that is, difference-GMM and system-GMM were estimated. A series of diagnostic tests were performed to choose among the three static 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. Similarly, for the two model settings under the dynamic GMM method, three diagnostic tests, that is, Arellano and Bond (1991) autocorrelation tests of first order and second order, and the Sargan test were considered. However, if both difference-GMM and system-GMM models passed all the three diagnostic tests, we would refer to the results of the system-GMM that had superior finite sample properties, especially for the sub-sector analysis which involved a smaller number of firms.

Reconciling the results and findings from the static panel regression models and the dynamic panel regression models, the estimated coefficients of the significant variables from the selected models for each sector are produced in Table 5. The Trading/Services had the highest number of variables affecting cost of equity. Five variables, namely, CR, DE, TAT, SIZE and SL, were found to be important determinants for the cost of equity of the sector. Consistent with the finding of Omran and Pointon (2004), CR was negatively related to COE. It means that firms in healthier financial positions and the ability to fulfill short-term obligations will have a lower cost of equity. Obviously, liquidity is likely to be more important to the Trading/Services sector than others as customers are more likely to pay by cash since firms with businesses related to utility, newspaper, food and department stores are listed under this sector. In the Construction sector, the cost of equity was significantly determined by CR, DE and TAT. In contrast to the Trading/Services sector, the sign of CR for the Construction sector was positive, suggesting that higher liquidity is related to higher cost of equity. This result, nonetheless, seems to be supported by a negative sign for DE. Higher debt in a firm seems to be viewed favourably by investors, probably as an indication of higher future growth. Therefore, high CR in this case could indicate inefficient use of funds, which is also suggested by the variable TAT that has a negative relationship with COE.

SIZE is the only significant variable for the Consumer Products sector and the Plantation sector. Some of the firms listed under the Consumer Products sector are multinational corporations (MNCs) such as British American Tobacco, Dutch Lady, Guinness Anchor and Nestle, all of which are large firms. Therefore, firm size could affect sustainability for other smaller local-based firms and the ability to borrow funds at lower cost. SIZE is also an important variable for the Technology sector along with SL. Estimates from the fixed-effect model revealed a positive sign for SL, which was not as expected. As technology firms are mostly viewed as risky, high SL could be interpreted as a negative signal. The only significant variable for the Properties sector was TAT, but the sign was not as expected. Higher

Table 5. Summary of the analyses on determinants of equity cost

Sector	Construction	Consumer products	Industrial Products	Plantation	Properties	Technology	Trading/Services	Majority
Model	System	System	Fixed	System	System	Fixed	Random	
Intercept	n.s.	36.1235	47.5649	n.s.	n.s.	n.s.	29.8045	Positive
CR	0.4515	n.s.	n.s.	n.s.	n.s.	n.s.	-0.3623	Mixed
DE	-0.0340	n.s.	n.s.	n.s.	n.s.	n.s.	0.0117	Mixed
EPS	n.s.	n.s.	4.9596	n.s.	n.s.	n.s.	n.s.	n.s.
TAT	-12.1568	n.s.	n.s.	n.s.	8.9611	n.s.	-4.7343	Negative
MB	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
SIZE	n.s.	-3.7746	-5.6267	-1.0911	n.s.	-8.5940	-3.6812	Negative
SL	n.s.	n.s.	n.s.	n.s.	n.s.	3.5005	1.6693	Positive

Note: n.s. denotes variables that are not statistically significant. CR is current assets divided by current liabilities; DE is total debt as percentage of 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.

managerial efficiency in utilising a firm's resources to generate sales is viewed unfavourably by investors for this sector as indicated by the positive sign for TAT. Contrary to the findings for the other sectors, EPS is found to be an important determinant for cost of equity in the Industrial Products sector apart from SIZE.

In general, with the exception of stock liquidity, the sign of the estimates produced by the full sample and across sectors was consistent with the expected sign for most cases. Firm size is an important determinant for most of the sectors and its effect on cost of equity is consistently negative. In addition, the results in Table 5 show that the determinants of cost of equity are not necessarily the same across different sectors. This supports the findings of other studies (see for example, Bekaert and Harvey, 1995; Hardouvelis *et al.*, 2007) which show that the sectoral effects are becoming more important.

4. Concluding Remarks

We employed firm-level data for seven sectors covering 354 firms listed in the Main Board of Bursa Malaysia from 3 January 2001 to 31 December 2008 to find the most relevant method to calculate cost of equity for the Malaysian stock market, and to determine 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 (the criterion adopted by Estrada 2000; 2001; 2002; Chen and Chen 2004) of panel regressions of firm returns on risk measures, the semi-deviation approach yielded the best model. This model explained about 40 per cent of the variations in stock returns and for some sectors, the figure exceeded 50 per cent. Using this measure, the average cost of equity estimated for Malaysian firms was 24.0 per cent. The sectoral estimate was 25.4 per cent for the Construction, 21.4 per cent for the Consumer Products, 25.3 per cent for the Industrial Products, 20.3 per cent for the Plantations, 26.7 per cent for the Properties, 23.9 per cent for the Technology and 23.2 per cent for the Trading/Services sectors.

This study reveals some interesting findings on the relationship between cost of equity and its determinants at the sectoral level. It turns out that firm size is an important determinant for most sectors, followed by total asset turnover ratio. Current ratio and debt-to-equity are important determinants in only two sectors, namely, the Construction sector and the Trading/Services sector while stock liquidity was found to be significant for the Technology sector and the Trading/Services sector. Significant effect of earnings per share on cost of equity was only found for one sector, which is the Industrial Products sector. Apparently, the number of important variables varies across sectors. The relationship of the variables with cost of equity may also differ by sector, as shown in the case of current ratio, debt-to-equity ratio and total asset turnover ratio. This justifies the need to have sector-level analyses and supports the findings of other studies (see for example, Bekaert and Harvey 1995; Hardouvelis *et al.* 2007) that document that analyses on the sectoral effects are becoming more important.

Several policy implications are derived from the results of this study. The first is related to the effect of firm size on cost of equity reported in this study. Investment spending of smaller firms is found to be not only more sensitive to interest rates but also relied more on internal funds as a cheaper source of financing (Abdul Karim 2010). Our results that cost of equity, which is a measure of cost of external financing, is higher for smaller firms present further empirical support. Smaller firms depend more on internal financing because such sources are cheaper and easier to get. Once internal funds are depleted, they may need to rely on external funding which include raising debts and issuing stocks. Therefore, monetary policy will have a greater impact on smaller firms when interest rates are the target instruments, since they directly affect the cost of funding. Therefore, the easing of monetary policy through lowering of interest rates during difficult times may help smaller firms remain stable and resilient.

The results of this study showed that accounting-based attributes are important determinants of cost of equity. However, these attributes are only as good as the accounting information provided by firms. Hence, the recent amendments to the Capital Market Services Act (CMSA) to strengthen the enforcement powers of the Securities Commission (SC) on corporate governance transgressions are deemed to be appropriate and timely. Steps have been taken by the authority to strive for better corporate governance. Under the Capital Markets and Services (Amendment) Act 2010, a person influencing, coercing, misleading or authorising any person engaged in the preparation or audit of financial statements of a private limited firm to do anything which causes the financial statements or audited financial statements to be false or misleading is committing an offence. Upon conviction, the person may face up to ten years of imprisonment or fine not exceeding ten million ringgit. On top of that, an independent Auditor Oversight Board was established through the tabling of amendments to the Securities Commission Act 1993. Nevertheless, these policies ought to couple with effective enforcement in order to ensure that investors have access to unbiased financial statements that would assist them in making informed investment decisions.

Last but not least, firms will benefit greatly if the government monitors the sector indicators in formulating their policy. For example, size is not shown to affect cost of equity for firms in the Construction and Properties sectors. Therefore, lowering interest rates may not benefit firms in these two sectors during an economic slowdown. Other policies such as those to boost demand may be more beneficial for the Construction sector as it is shown that a higher turnover asset ratio is related to a lower cost of equity. While market-targeted policies are important, they need to also address the sectoral differences in order to maintain the dynamic balances of the different sectors in the stock exchange. Given the closeness and interdependence of the sectors, the failure of one sector to perform can affect the performance of the whole market.

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