CHAPTER 4
MEASURES OF COST OF EQUITY

4.1 Descriptive Statistics of the Time Series Data

This chapter describes briefly the statistical behaviour of the time series data used in the estimation of cost of equity. The estimates of the risk measures and cost of equity for the different models are reported and examined for the full sample and sub-sectors.

The averages for firm stock returns, market returns, risk-free rates and market risk premiums for the period 2001-2008 are shown in Table 4.1. All of them are ex-post values except for the market risk premiums which are the ex-ante values.

Overall, the 2001 Dot.Com bubble burst was felt in 2001 and 2002 where the market returns for both Malaysia and the U.S. as well as some sectoral stock returns recorded negative values. The 2001 Dot.Com bubble was a speculative bubble hovering on internet stocks in the late 1990s where the stock prices of the internet sector increased rapidly due to over optimism of investors on internet-related firms even though these firms may not be generating profits. The bubble deflated at an accelerated speed in 2001, resulting in financial difficulties for many firms. It is interesting to discover that the Plantations sector is sheltered from the adverse impact of the bubble burst and was the only sector with a positive average return in 2002.

Nevertheless, the market seemed to have recovered from the aftermath temporarily where the KLCI and the MSCI US achieve average positive returns of 21.37 percent and 22.19 percent, respectively in 2003. It was a good year where most sectors had outperformed the market index. In the following two years, the stock markets were on
the downtrend again with majority of stock returns deteriorated below zero percent. 
Market performance seems to pick up in 2006 and peaked in 2007 with the KLCI recorded a positive average weekly return of 28 percent while for some sectors, average returns was as high as 55.75 percent. The U.S. subprime crisis finally took its toll on the stock markets when large negative returns were recorded in 2008. Not even the Plantations sector was spared. In sum, the period of 2001-2008 saw ups and downs in the Malaysian and world stock market movements.

On the other hand, local and global annual risk-free rates are relatively more stable with an average of 4.28 percent and 2.69 percent, respectively. Extracted from Damodaran’s website, the annual ex-ante market risk premium for Malaysia were between 6.07 percent to 7.63 percent while the global market risk premium fluctuated within a narrower range of 4.51 percent to 5.51 percent. If the excess market return computation \( (R_m - R_f) \) is used to calculate market risk premiums, negative values would have been found for the Malaysian market, for example, large negative return in KLCI was recorded in 2008. Since negative values could not be used for the market risk premium, the problem is hence solved by using the market risk premiums obtained via Damodaran’s sovereign bond premium approach.
Table 4.1: Firm Returns, Risk-Free Rates and the Market Risk Premiums (in percent)

<table>
<thead>
<tr>
<th>Year</th>
<th>(No. of Firms)</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>Grand Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Average Annual Firm Returns</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction</td>
<td>(28)</td>
<td>4.70</td>
<td>-18.53</td>
<td>36.55</td>
<td>-28.31</td>
<td>-39.13</td>
<td>32.51</td>
<td>46.11</td>
<td>-63.11</td>
<td>-3.65</td>
</tr>
<tr>
<td>Consumer Products</td>
<td>(54)</td>
<td>0.46</td>
<td>-15.61</td>
<td>14.21</td>
<td>-3.89</td>
<td>-9.38</td>
<td>8.42</td>
<td>7.89</td>
<td>-31.05</td>
<td>-3.62</td>
</tr>
<tr>
<td>Industrial Products</td>
<td>(129)</td>
<td>-2.97</td>
<td>-16.59</td>
<td>31.00</td>
<td>-10.06</td>
<td>-38.54</td>
<td>20.19</td>
<td>10.61</td>
<td>-46.30</td>
<td>-6.58</td>
</tr>
<tr>
<td>Plantations</td>
<td>(21)</td>
<td>9.29</td>
<td>10.56</td>
<td>16.07</td>
<td>10.16</td>
<td>-4.37</td>
<td>28.69</td>
<td>55.75</td>
<td>-48.51</td>
<td>9.71</td>
</tr>
<tr>
<td>Properties</td>
<td>(33)</td>
<td>-4.07</td>
<td>-23.22</td>
<td>27.96</td>
<td>-7.61</td>
<td>-39.69</td>
<td>28.39</td>
<td>45.69</td>
<td>-70.17</td>
<td>-5.34</td>
</tr>
<tr>
<td>Technology</td>
<td>(12)</td>
<td>2.09</td>
<td>-18.09</td>
<td>29.76</td>
<td>-32.08</td>
<td>-47.46</td>
<td>11.31</td>
<td>-6.15</td>
<td>-53.61</td>
<td>-14.28</td>
</tr>
<tr>
<td>Trading/Services</td>
<td>(77)</td>
<td>-3.62</td>
<td>-17.49</td>
<td>26.66</td>
<td>-3.11</td>
<td>-22.92</td>
<td>20.73</td>
<td>19.33</td>
<td>-52.38</td>
<td>-4.10</td>
</tr>
<tr>
<td><strong>Average Annual Market Returns</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>KLCI</td>
<td></td>
<td>-3.79</td>
<td>-3.52</td>
<td>21.37</td>
<td>15.49</td>
<td>-0.86</td>
<td>19.13</td>
<td>28.00</td>
<td>-45.88</td>
<td>3.74</td>
</tr>
<tr>
<td><strong>Annual Risk-Free Rate</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local</td>
<td></td>
<td>4.78</td>
<td>3.66</td>
<td>2.46</td>
<td>2.82</td>
<td>4.57</td>
<td>6.12</td>
<td>5.75</td>
<td>4.05</td>
<td>4.28</td>
</tr>
<tr>
<td>Global (US)</td>
<td></td>
<td>3.48</td>
<td>1.64</td>
<td>1.03</td>
<td>1.39</td>
<td>3.22</td>
<td>4.85</td>
<td>4.48</td>
<td>1.42</td>
<td>2.69</td>
</tr>
<tr>
<td><strong>Ex-Ante Annual Market Risk Premium</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local</td>
<td></td>
<td>6.81</td>
<td>6.54</td>
<td>6.25</td>
<td>6.27</td>
<td>6.15</td>
<td>6.19</td>
<td>6.07</td>
<td>7.63</td>
<td>6.49</td>
</tr>
<tr>
<td>Global (US)</td>
<td></td>
<td>5.51</td>
<td>4.51</td>
<td>4.82</td>
<td>4.84</td>
<td>4.80</td>
<td>4.91</td>
<td>4.79</td>
<td>5.00</td>
<td>4.90</td>
</tr>
</tbody>
</table>

Notes: The returns were computed on the basis of the US dollars.
4.2 Estimates of the Risk Measures and Their Properties

Estimated risk measures from equations (3.2a), (3.3a), (3.4a), (3.5a), (3.6a), (3.7a), (3.8a) and (3.9a) are tabulated in Table 4.2 for the full sample and Table 4.3 to Table 4.9 for each sector.

In line with Estrada (2000), as can be seen from Table 4.2, the risk measures based on total risk and downside risk are substantially higher than those based on systematic risk with the exception of the two-factor model where $\beta_{Li}^D$ is lower than $\beta_{Li}$ in 2001 and 2002. The estimated beta from LCAPM, $\beta_i$, ranges from 0.7717 to 1.4061. Using market index covering the 1988-1998 period, Estrada (2000) found an average beta of 1.30 for Malaysia. We also found $\beta_i$ to be much larger than $\beta_i^G$ for the one-factor CAPM model. This observation is also true for its downside version, except for 2001, where $\beta_i^{DG}$ is slightly larger than $\beta_i^D$. In the joint estimation of local beta and global beta, that is, the two-factor version, it is shown that local beta estimates are higher too. This indicates that the local market index has a dominant influence on stocks in Malaysia, and firms have higher exposure to local market movements. Estrada (2000) documented that the semi-deviation and standard deviation (total risk) for Malaysian market index as 6.67 and 9.96, respectively. In this study, the semi-deviation is found to be in the range of 3.2360-5.6498 and the standard deviation ranges from 4.6977-7.3888. This could mean that the overall risk has reduced for the Malaysian market since 1998.

Tables 4.3, 4.4, 4.5, 4.6, 4.7, 4.8 and 4.9 report the annual average of risk measures for firms in the Construction sector, Consumer Products sector, Industrial Products sector, Plantations sector, Properties sector, Technology sector and Trading/Services sector, respectively. In general, there are consistencies in results across the seven sectors with those of the full sample on two aspects. First, larger risk measures were found based on
total risk and downside risk than those based on systematic risk. Second, the local market dominance influence on stock returns is also true for the different sectors. The range of $\beta_i$ for the Construction sector (0.7217–1.4308), Consumer Products (0.4997–1.1894), Industrial Products sector (0.6245–1.4128), Properties sector (1.0008–1.8528) and Technology sector (0.4381–1.6395) are larger than the values for the full sample (0.7717–1.4061). On the other hand, the Plantations sector (0.8415–1.3269) and Trading/Services sector (0.8276–1.4004) have smaller $\beta_i$ estimates compared to the full sample. All seven sectors also share the exception in the two-factor model where $\beta_{Li}^D$ is not found to be greater than $\beta_{Li}$ in 2001 and 2002. Nonetheless, for the Plantations sector, $\beta_{Li}^D$ is less than $\beta_{Li}$ only found for 2001.

Sectors which have a higher range than range of the full sample $\beta_i$ range also have higher range for $\delta_{Rp,i}$ and $\sigma_i$. However, it appears that the Consumer Products sector has switched place with the Plantations sector with the $\delta_{Rp,i}$ and $\sigma_i$ of the former having a lower range while the latter has a higher range for both estimates. Besides having the highest range for $\beta_i$, the Technology sector also has the highest $\sigma_i$ range among all the sectors. Despite being recorded as the sector with the lowest $\beta_i$ range, the Plantations sector is shown to have the highest $\delta_{Rp,i}$ range. On the other hand, the Trading/Services sector has been consistently less risky than most of the sectors by having lower range of $\beta_i$, $\delta_{Rp,i}$ and $\sigma_i$ than the range for the full sample.
Table 4.2: Annual Averages of Firm Risk Measures for Full Sample

<table>
<thead>
<tr>
<th>Risk Measure</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\beta_i$</td>
<td>1.1900</td>
<td>0.9620</td>
<td>1.4061</td>
<td>0.7717</td>
<td>0.9729</td>
<td>1.1347</td>
<td>0.8856</td>
<td>0.7720</td>
</tr>
<tr>
<td>$\rho_i'$</td>
<td>1.3268</td>
<td>1.2222</td>
<td>2.0895</td>
<td>1.6624</td>
<td>2.1527</td>
<td>1.8647</td>
<td>1.6255</td>
<td>1.1032</td>
</tr>
<tr>
<td>$\rho_i''$</td>
<td>0.6645</td>
<td>0.1616</td>
<td>0.2502</td>
<td>0.0960</td>
<td>-0.0220</td>
<td>0.5522</td>
<td>0.5506</td>
<td>0.1867</td>
</tr>
<tr>
<td>$\rho_i'''$</td>
<td>1.4254</td>
<td>0.7553</td>
<td>1.4231</td>
<td>1.4222</td>
<td>1.4775</td>
<td>1.6479</td>
<td>1.2682</td>
<td>0.5170</td>
</tr>
<tr>
<td>$\beta_{Lt}$</td>
<td>1.1076</td>
<td>0.9600</td>
<td>1.3947</td>
<td>0.8048</td>
<td>1.0390</td>
<td>1.0873</td>
<td>0.8804</td>
<td>0.7849</td>
</tr>
<tr>
<td>$\beta_{Gt}$</td>
<td>0.3414</td>
<td>0.0049</td>
<td>0.0554</td>
<td>-0.1465</td>
<td>-0.2719</td>
<td>0.1148</td>
<td>0.0109</td>
<td>-0.0298</td>
</tr>
<tr>
<td>$\delta_{Re-Lt}$</td>
<td>0.8798</td>
<td>0.8762</td>
<td>2.2446</td>
<td>1.3162</td>
<td>1.2475</td>
<td>1.4721</td>
<td>1.3635</td>
<td>1.0264</td>
</tr>
<tr>
<td>$\delta_{Gt}$</td>
<td>0.8258</td>
<td>0.3724</td>
<td>0.5839</td>
<td>0.7217</td>
<td>0.9929</td>
<td>0.8292</td>
<td>0.3387</td>
<td>0.1251</td>
</tr>
<tr>
<td>$\sigma_t$</td>
<td>4.9826</td>
<td>3.4972</td>
<td>3.6229</td>
<td>3.2360</td>
<td>3.6856</td>
<td>3.4398</td>
<td>3.9382</td>
<td>5.6498</td>
</tr>
</tbody>
</table>

Notes: The risk measures are as depicted in equations (3.2a), (3.3a), (3.4a), (3.5a), (3.6a), (3.7a), (3.8a) and (3.9a).

Table 4.3: Annual Averages of Firm Risk Measures for Construction Sector

<table>
<thead>
<tr>
<th>Risk Measure</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\beta_i$</td>
<td>1.3268</td>
<td>1.0860</td>
<td>1.4547</td>
<td>0.7217</td>
<td>1.0089</td>
<td>1.4308</td>
<td>1.1737</td>
<td>1.1460</td>
</tr>
<tr>
<td>$\rho_i'$</td>
<td>1.4054</td>
<td>1.2103</td>
<td>2.2250</td>
<td>1.8866</td>
<td>2.1363</td>
<td>2.1094</td>
<td>2.1685</td>
<td>1.3404</td>
</tr>
<tr>
<td>$\rho_i''$</td>
<td>0.6743</td>
<td>0.1988</td>
<td>0.2127</td>
<td>0.0571</td>
<td>0.1929</td>
<td>1.0008</td>
<td>0.6792</td>
<td>0.3204</td>
</tr>
<tr>
<td>$\rho_i'''$</td>
<td>1.4648</td>
<td>0.8080</td>
<td>1.4963</td>
<td>1.7582</td>
<td>1.6350</td>
<td>2.0109</td>
<td>1.5006</td>
<td>0.6832</td>
</tr>
<tr>
<td>$\beta_{Lt}$</td>
<td>1.2151</td>
<td>1.0765</td>
<td>1.4527</td>
<td>0.7607</td>
<td>1.0218</td>
<td>1.2205</td>
<td>1.2006</td>
<td>1.1439</td>
</tr>
<tr>
<td>$\beta_{Gt}$</td>
<td>0.3198</td>
<td>0.0231</td>
<td>0.0098</td>
<td>-0.1721</td>
<td>-0.0528</td>
<td>0.5099</td>
<td>-0.0567</td>
<td>0.0049</td>
</tr>
<tr>
<td>$\rho_{Lt}$</td>
<td>0.9133</td>
<td>0.7828</td>
<td>2.2801</td>
<td>1.4274</td>
<td>1.3275</td>
<td>1.4895</td>
<td>2.0655</td>
<td>1.2382</td>
</tr>
<tr>
<td>$\rho_{Gt}$</td>
<td>0.8604</td>
<td>0.4513</td>
<td>0.6382</td>
<td>0.9950</td>
<td>1.0359</td>
<td>1.2713</td>
<td>0.0697</td>
<td>0.2061</td>
</tr>
<tr>
<td>$\delta_{Re-Lt}$</td>
<td>5.1204</td>
<td>3.6767</td>
<td>3.6608</td>
<td>3.7034</td>
<td>3.7982</td>
<td>3.5356</td>
<td>4.2006</td>
<td>6.5937</td>
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<tr>
<td>$\sigma_t$</td>
<td>4.9826</td>
<td>3.4972</td>
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<td>3.2360</td>
<td>3.6856</td>
<td>3.4398</td>
<td>3.9382</td>
<td>5.6498</td>
</tr>
</tbody>
</table>

Notes: The risk measures are as depicted in equations (3.2a), (3.3a), (3.4a), (3.5a), (3.6a), (3.7a), (3.8a) and (3.9a).
### Table 4.4: Annual Averages of Firm Risk Measures for Consumer Products Sector

<table>
<thead>
<tr>
<th>Risk Measure</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>$p_t$</td>
<td>0.9482</td>
<td>0.8154</td>
<td>1.1894</td>
<td>0.6653</td>
<td>0.8009</td>
<td>0.8026</td>
<td>0.5522</td>
<td>0.4997</td>
</tr>
<tr>
<td>$p_t^P$</td>
<td>1.0810</td>
<td>1.0165</td>
<td>2.0712</td>
<td>1.4908</td>
<td>1.8092</td>
<td>1.4763</td>
<td>1.1502</td>
<td>0.8646</td>
</tr>
<tr>
<td>$p_t^Q$</td>
<td>0.5030</td>
<td>0.1194</td>
<td>0.2136</td>
<td>0.1060</td>
<td>-0.1035</td>
<td>0.2806</td>
<td>0.3855</td>
<td>0.1459</td>
</tr>
<tr>
<td>$p_t^{Q0}$</td>
<td>1.2082</td>
<td>0.5823</td>
<td>1.2825</td>
<td>1.1724</td>
<td>1.2026</td>
<td>1.2644</td>
<td>0.9040</td>
<td>0.4365</td>
</tr>
<tr>
<td>$p_{Lt}$</td>
<td>0.8894</td>
<td>0.8215</td>
<td>1.1794</td>
<td>0.6883</td>
<td>0.8774</td>
<td>0.8235</td>
<td>0.5208</td>
<td>0.4957</td>
</tr>
<tr>
<td>$p_{Lt}$</td>
<td>0.2436</td>
<td>-0.0147</td>
<td>0.0489</td>
<td>-0.1014</td>
<td>-0.3145</td>
<td>-0.0506</td>
<td>0.0663</td>
<td>0.0091</td>
</tr>
<tr>
<td>$p_{Lt}^P$</td>
<td>0.6667</td>
<td>0.7507</td>
<td>2.0054</td>
<td>1.2860</td>
<td>0.9249</td>
<td>1.1489</td>
<td>0.9309</td>
<td>0.7288</td>
</tr>
<tr>
<td>$p_{Lt}^Q$</td>
<td>0.7341</td>
<td>0.2730</td>
<td>0.4826</td>
<td>0.5665</td>
<td>0.7953</td>
<td>0.6842</td>
<td>0.2826</td>
<td>0.1578</td>
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<tr>
<td>$g_{Rt-1}$</td>
<td>4.2507</td>
<td>2.9790</td>
<td>3.3189</td>
<td>2.9742</td>
<td>3.1697</td>
<td>3.2714</td>
<td>3.1448</td>
<td>4.6257</td>
</tr>
<tr>
<td>$\sigma_t$</td>
<td>5.9969</td>
<td>4.3745</td>
<td>5.0881</td>
<td>4.2924</td>
<td>4.4625</td>
<td>5.0039</td>
<td>4.8707</td>
<td>6.0524</td>
</tr>
</tbody>
</table>

Notes: The risk measures are as depicted in equations (3.2a), (3.3a), (3.4a), (3.5a), (3.6a), (3.7a), (3.8a) and (3.9a).

### Table 4.5: Annual Averages of Firm Risk Measures for Industrial Products Sector

<table>
<thead>
<tr>
<th>Risk Measure</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>$p_t$</td>
<td>1.1976</td>
<td>0.9297</td>
<td>1.4128</td>
<td>0.7049</td>
<td>1.0000</td>
<td>1.1735</td>
<td>0.8916</td>
<td>0.6245</td>
</tr>
<tr>
<td>$p_t^P$</td>
<td>1.3696</td>
<td>1.2303</td>
<td>2.1000</td>
<td>1.7043</td>
<td>2.3928</td>
<td>2.0321</td>
<td>1.7406</td>
<td>1.0316</td>
</tr>
<tr>
<td>$p_t^Q$</td>
<td>0.6766</td>
<td>0.1415</td>
<td>0.2685</td>
<td>0.0340</td>
<td>-0.0065</td>
<td>0.4997</td>
<td>0.5537</td>
<td>0.1746</td>
</tr>
<tr>
<td>$p_t^{Q0}$</td>
<td>1.5163</td>
<td>0.7633</td>
<td>1.4525</td>
<td>1.5119</td>
<td>1.6313</td>
<td>1.7869</td>
<td>1.3785</td>
<td>0.4715</td>
</tr>
<tr>
<td>$p_{Lt}$</td>
<td>1.1127</td>
<td>0.9343</td>
<td>1.3977</td>
<td>0.7483</td>
<td>1.0638</td>
<td>1.1597</td>
<td>0.8869</td>
<td>0.6234</td>
</tr>
<tr>
<td>$p_{Lt}$</td>
<td>0.3521</td>
<td>-0.0110</td>
<td>0.0732</td>
<td>-0.1915</td>
<td>-0.2624</td>
<td>0.0333</td>
<td>0.0101</td>
<td>0.0026</td>
</tr>
<tr>
<td>$p_{Lt}^P$</td>
<td>0.8746</td>
<td>0.8717</td>
<td>2.4101</td>
<td>1.2890</td>
<td>1.4994</td>
<td>1.6396</td>
<td>1.4115</td>
<td>1.0387</td>
</tr>
<tr>
<td>$p_{Lt}^Q$</td>
<td>0.9209</td>
<td>0.3817</td>
<td>0.5396</td>
<td>0.8102</td>
<td>1.0575</td>
<td>0.8454</td>
<td>0.4269</td>
<td>0.0806</td>
</tr>
<tr>
<td>$g_{Rt-1}$</td>
<td>5.1886</td>
<td>3.5969</td>
<td>3.7847</td>
<td>3.3511</td>
<td>4.1087</td>
<td>3.6994</td>
<td>4.4052</td>
<td>5.9520</td>
</tr>
<tr>
<td>$\sigma_t$</td>
<td>7.2926</td>
<td>5.1816</td>
<td>6.3270</td>
<td>4.8623</td>
<td>5.3007</td>
<td>5.9847</td>
<td>6.7728</td>
<td>7.9414</td>
</tr>
</tbody>
</table>

Notes: The risk measures are as depicted in equations (3.2a), (3.3a), (3.4a), (3.5a), (3.6a), (3.7a), (3.8a) and (3.9a).
### Table 4.6: Annual Averages of Firm Risk Measures for Plantations Sector

<table>
<thead>
<tr>
<th>Risk Measure</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \rho_t )</td>
<td>1.0601</td>
<td>0.8415</td>
<td>1.0422</td>
<td>0.8427</td>
<td>0.8844</td>
<td>1.0065</td>
<td>0.8516</td>
<td>1.3269</td>
</tr>
<tr>
<td>( \rho_L )</td>
<td>1.1674</td>
<td>1.0925</td>
<td>1.8016</td>
<td>1.7299</td>
<td>1.5597</td>
<td>1.4339</td>
<td>1.3117</td>
<td>1.5278</td>
</tr>
<tr>
<td>( \rho_P )</td>
<td>0.6387</td>
<td>0.1515</td>
<td>0.1028</td>
<td>-0.0039</td>
<td>0.1404</td>
<td>0.5845</td>
<td>0.4574</td>
<td>0.2695</td>
</tr>
<tr>
<td>( \rho_Q )</td>
<td>1.3355</td>
<td>0.6902</td>
<td>1.0158</td>
<td>1.1322</td>
<td>1.0779</td>
<td>1.2126</td>
<td>1.1242</td>
<td>0.6063</td>
</tr>
<tr>
<td>( \rho_{LL} )</td>
<td>0.9746</td>
<td>0.8352</td>
<td>1.0512</td>
<td>0.9053</td>
<td>0.9030</td>
<td>0.9176</td>
<td>0.8948</td>
<td>1.3743</td>
</tr>
<tr>
<td>( \rho_{GL} )</td>
<td>0.3544</td>
<td>0.0152</td>
<td>-0.0440</td>
<td>-0.2767</td>
<td>-0.0768</td>
<td>0.2154</td>
<td>-0.0911</td>
<td>-0.1096</td>
</tr>
<tr>
<td>( \rho_{PL} )</td>
<td>0.7478</td>
<td>0.8532</td>
<td>1.6541</td>
<td>1.3174</td>
<td>1.0028</td>
<td>1.1618</td>
<td>1.0014</td>
<td>1.4821</td>
</tr>
<tr>
<td>( \rho_{QL} )</td>
<td>0.7804</td>
<td>0.3116</td>
<td>0.5100</td>
<td>0.3324</td>
<td>0.6132</td>
<td>0.6174</td>
<td>0.3236</td>
<td>0.0320</td>
</tr>
<tr>
<td>( \delta_{R_{P, t}} )</td>
<td>4.2782</td>
<td>2.8496</td>
<td>2.8593</td>
<td>3.0037</td>
<td>2.3664</td>
<td>2.3091</td>
<td>2.8857</td>
<td>5.4204</td>
</tr>
<tr>
<td>( \omega_t )</td>
<td>6.4615</td>
<td>4.6220</td>
<td>4.5492</td>
<td>4.5276</td>
<td>3.4720</td>
<td>3.9556</td>
<td>5.3939</td>
<td>6.7516</td>
</tr>
</tbody>
</table>

Notes: The risk measures are as depicted in equations (3.2a), (3.3a), (3.4a), (3.5a), (3.6a), (3.7a), (3.8a) and (3.9a).

### Table 4.7: Annual Averages of Firm Risk Measures for Properties Sector

<table>
<thead>
<tr>
<th>Risk Measure</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \rho_t )</td>
<td>1.3840</td>
<td>1.1003</td>
<td>1.8528</td>
<td>1.0202</td>
<td>1.3110</td>
<td>1.5281</td>
<td>1.2415</td>
<td>1.0008</td>
</tr>
<tr>
<td>( \rho_L )</td>
<td>1.4812</td>
<td>1.4060</td>
<td>2.4006</td>
<td>1.7468</td>
<td>2.5939</td>
<td>2.1289</td>
<td>2.0303</td>
<td>1.3998</td>
</tr>
<tr>
<td>( \rho_P )</td>
<td>0.8662</td>
<td>0.2435</td>
<td>0.2767</td>
<td>0.1613</td>
<td>0.0558</td>
<td>0.8352</td>
<td>0.6569</td>
<td>0.1739</td>
</tr>
<tr>
<td>( \rho_Q )</td>
<td>1.5233</td>
<td>0.8891</td>
<td>1.8386</td>
<td>1.5136</td>
<td>1.7723</td>
<td>1.6457</td>
<td>1.4997</td>
<td>0.5910</td>
</tr>
<tr>
<td>( \rho_{LL} )</td>
<td>1.2639</td>
<td>1.0721</td>
<td>1.8490</td>
<td>1.0557</td>
<td>1.3779</td>
<td>1.4190</td>
<td>1.3111</td>
<td>1.0509</td>
</tr>
<tr>
<td>( \rho_{GL} )</td>
<td>0.4975</td>
<td>0.0685</td>
<td>0.0184</td>
<td>-0.1568</td>
<td>-0.2756</td>
<td>0.2644</td>
<td>-0.1467</td>
<td>-0.1160</td>
</tr>
<tr>
<td>( \rho_{PL} )</td>
<td>1.0446</td>
<td>0.9280</td>
<td>3.1278</td>
<td>1.5245</td>
<td>1.3473</td>
<td>1.8083</td>
<td>1.7862</td>
<td>1.3139</td>
</tr>
<tr>
<td>( \rho_{QL} )</td>
<td>0.8505</td>
<td>0.4989</td>
<td>0.5631</td>
<td>0.7460</td>
<td>1.3267</td>
<td>0.7224</td>
<td>0.3504</td>
<td>0.1078</td>
</tr>
<tr>
<td>( \delta_{R_{P, t}} )</td>
<td>5.5049</td>
<td>4.0795</td>
<td>4.3558</td>
<td>3.4406</td>
<td>4.4013</td>
<td>3.7388</td>
<td>4.5015</td>
<td>6.3861</td>
</tr>
<tr>
<td>( \omega_t )</td>
<td>7.9725</td>
<td>5.9226</td>
<td>7.3144</td>
<td>5.3233</td>
<td>5.7580</td>
<td>6.0352</td>
<td>7.6322</td>
<td>8.1069</td>
</tr>
</tbody>
</table>

Notes: The risk measures are as depicted in equations (3.2a), (3.3a), (3.4a), (3.5a), (3.6a), (3.7a), (3.8a) and (3.9a).
Table 4.8: Annual Averages of Firm Risk Measures for Technology Sector

<table>
<thead>
<tr>
<th>Risk Measure</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\rho_t$</td>
<td>1.3917</td>
<td>1.3214</td>
<td>1.6395</td>
<td>0.6222</td>
<td>0.4381</td>
<td>1.4572</td>
<td>0.8149</td>
<td>0.7538</td>
</tr>
<tr>
<td>$\rho_p$</td>
<td>1.4711</td>
<td>1.3785</td>
<td>2.0885</td>
<td>1.4713</td>
<td>1.8827</td>
<td>2.5539</td>
<td>1.5441</td>
<td>1.0522</td>
</tr>
<tr>
<td>$\rho_l$</td>
<td>0.8670</td>
<td>0.3276</td>
<td>0.4876</td>
<td>0.2322</td>
<td>0.0510</td>
<td>1.0945</td>
<td>0.5598</td>
<td>0.1605</td>
</tr>
<tr>
<td>$\rho_{pq}$</td>
<td>1.6158</td>
<td>0.8523</td>
<td>1.4147</td>
<td>1.1987</td>
<td>1.2285</td>
<td>2.2451</td>
<td>1.1941</td>
<td>0.4745</td>
</tr>
<tr>
<td>$\rho_{lt}$</td>
<td>1.2721</td>
<td>1.2721</td>
<td>1.5849</td>
<td>0.6113</td>
<td>0.4521</td>
<td>1.2059</td>
<td>0.7745</td>
<td>0.7771</td>
</tr>
<tr>
<td>$\rho_{ql}$</td>
<td>0.4959</td>
<td>0.1200</td>
<td>0.2662</td>
<td>0.0480</td>
<td>-0.0578</td>
<td>0.6095</td>
<td>0.0851</td>
<td>-0.0539</td>
</tr>
<tr>
<td>$\rho_{lp}$</td>
<td>0.9589</td>
<td>1.0086</td>
<td>2.1035</td>
<td>1.1679</td>
<td>1.1773</td>
<td>2.0192</td>
<td>1.2803</td>
<td>0.8021</td>
</tr>
<tr>
<td>$\rho_{pl}$</td>
<td>0.9354</td>
<td>0.4495</td>
<td>0.8532</td>
<td>0.7011</td>
<td>0.7435</td>
<td>1.1888</td>
<td>0.3979</td>
<td>0.1108</td>
</tr>
<tr>
<td>$\delta_{R_F}$</td>
<td>5.0774</td>
<td>3.5000</td>
<td>3.1291</td>
<td>2.9482</td>
<td>3.2504</td>
<td>4.2582</td>
<td>3.7280</td>
<td>5.9522</td>
</tr>
<tr>
<td>$\sigma_t$</td>
<td>7.7948</td>
<td>5.1649</td>
<td>5.3333</td>
<td>3.7434</td>
<td>3.8926</td>
<td>6.8580</td>
<td>5.7409</td>
<td>7.2887</td>
</tr>
</tbody>
</table>

Notes: The risk measures are as depicted in equations (3.2a), (3.3a), (3.4a), (3.5a), (3.6a), (3.7a), (3.8a) and (3.9a).

Table 4.9: Annual Averages of Firm Risk Measures for Trading/Services Sector

<table>
<thead>
<tr>
<th>Risk Measure</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\rho_t$</td>
<td>1.2305</td>
<td>0.9912</td>
<td>1.4004</td>
<td>0.8737</td>
<td>0.9975</td>
<td>1.0110</td>
<td>0.8724</td>
<td>0.8276</td>
</tr>
<tr>
<td>$\rho_p$</td>
<td>1.3539</td>
<td>1.2895</td>
<td>1.9809</td>
<td>1.6062</td>
<td>2.0118</td>
<td>1.6644</td>
<td>1.4936</td>
<td>1.0695</td>
</tr>
<tr>
<td>$\rho_l$</td>
<td>0.6431</td>
<td>0.1531</td>
<td>0.2507</td>
<td>0.1853</td>
<td>-0.1578</td>
<td>0.4527</td>
<td>0.5929</td>
<td>0.1740</td>
</tr>
<tr>
<td>$\rho_{pq}$</td>
<td>1.3638</td>
<td>0.7893</td>
<td>1.3803</td>
<td>1.3997</td>
<td>1.3766</td>
<td>1.5784</td>
<td>1.2057</td>
<td>0.5399</td>
</tr>
<tr>
<td>$\rho_{lt}$</td>
<td>1.1568</td>
<td>0.9951</td>
<td>1.3888</td>
<td>0.8927</td>
<td>1.1002</td>
<td>0.9882</td>
<td>0.8335</td>
<td>0.8542</td>
</tr>
<tr>
<td>$\rho_{ql}$</td>
<td>0.3057</td>
<td>-0.0094</td>
<td>0.0567</td>
<td>-0.0837</td>
<td>-0.4225</td>
<td>0.0552</td>
<td>0.0820</td>
<td>-0.0616</td>
</tr>
<tr>
<td>$\rho_{lp}$</td>
<td>0.9789</td>
<td>0.9690</td>
<td>1.9267</td>
<td>1.2760</td>
<td>1.0576</td>
<td>1.2672</td>
<td>1.2616</td>
<td>0.9250</td>
</tr>
<tr>
<td>$\rho_{pl}$</td>
<td>0.7028</td>
<td>0.3482</td>
<td>0.6964</td>
<td>0.6819</td>
<td>1.0071</td>
<td>0.7906</td>
<td>0.3181</td>
<td>0.1824</td>
</tr>
<tr>
<td>$\delta_{R_F}$</td>
<td>5.0541</td>
<td>3.5552</td>
<td>3.5225</td>
<td>3.0773</td>
<td>3.4183</td>
<td>3.1406</td>
<td>3.6954</td>
<td>5.2181</td>
</tr>
<tr>
<td>$\sigma_t$</td>
<td>7.0890</td>
<td>5.0685</td>
<td>5.7196</td>
<td>4.5924</td>
<td>4.9703</td>
<td>5.2000</td>
<td>5.8211</td>
<td>6.8897</td>
</tr>
</tbody>
</table>

Notes: The risk measures are as depicted in equations (3.2a), (3.3a), (3.4a), (3.5a), (3.6a), (3.7a), (3.8a) and (3.9a).

In order to have a better understanding of the trend of various risk measures across the year for the full sample and the seven sectors, the estimates are plotted in Figure 4.1 to
Figure 4.10. Figure 4.1 shows the local beta estimates across sectors as well as for the full sample from 2001 to 2008. Overall, declining local beta values are observed for all the sectors, except for the Plantations sector which show a jump in the beta estimate for 2008. Besides that, the trend portrayed by the Technology sector deviates slightly from the rest, especially in 2005 where it experienced a drop in the local beta estimate rather than an increase as is the case of the other sectors. The rest of the risk measures also show declining trend especially in recent years – downside local beta (Figure 4.2), global beta (Figure 4.3), downside global beta (Figure 4.4), local and global betas for the two-factor model (Figure 4.5 and Figure 4.6, respectively) as well as their downside versions (Figure 4.7 and Figure 4.8, respectively). However, for semi-deviation (Figure 4.9) and standard deviation (Figure 4.10), an increasing trend is observed.

For the one-factor model, the Plantations sector and the Technology sector frequently show behaviour different from the rest although their trends are more uniform with the others for the global market related risk measures. Similar observations are also found for the risk measures from the two-factor model. It is clear from the line graphs provided in Figures 4.1 through Figure 4.10 that although the trend shown by the sectors seems to conform to each other, some sectors tend to deviate more from the common trend such as the Plantations sector and the Technology sector, being the more obvious. This justifies the need to examine the cost of equity on a sectoral basis. Most of the time, the Property sector and the Technology sector have the highest risk estimates and occasionally, the Construction sector. On the contrary, the Plantations sector and the Consumer Products sector are shown to have lower risk estimates.

In order to have a clearer comparison of the estimated risk measures across the various sectors, a summary of the averages is provided in Table 4.10. On average, semi-
deviation estimates are lower than those of standard deviation, while estimated downside betas are greater than standard betas. This observation is in accord with Estrada’s (2000, 2001) findings. 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 $\beta_i$ 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 $\beta_i$ values. The other three sectors, Consumer Products, Industrial Products, and Plantations have lower average $\beta_i$ of 0.7842, 0.9918 and 0.9820, respectively.

On the contrary, $\beta_i^G$ 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, $\beta_{Li}$ ends up with average values greater than $\beta_{Gi}$. 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 $\beta_{Gi}$ from the two-factor model is much lower than $\beta_i^G$ 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.
Not only does the Properties sector have the highest local beta estimates for both one-factor and two-factor models, it also has the largest semi-deviation and standard deviation estimates. The Technology sector is shown to have the highest figures for $\beta_i^G$ and $\beta_G$ while the largest $\beta_i^{DG}$ and $\beta_{Gi}^D$ estimates are found for the Construction sector. On the other hand, the Consumer Products sector recorded the lowest estimates for six out of the ten risk measures while the Plantations sector for the other four. The results suggest that the Properties sector has the highest risk while the Consumer Products sector has the lowest risk among the seven sectors.
Figure 4.1 Local Beta Estimates across Sectors from 2001 to 2008

Figure 4.2 Downside Local Beta Estimates across Sectors from 2001 to 2008

Figure 4.3 Global Beta Estimates across Sectors from 2001 to 2008

Figure 4.4 Downside Global Beta Estimates across Sectors from 2001 to 2008
Figure 4.5 Two-Factor Local Beta Estimates across Sectors from 2001 to 2008

Figure 4.6 Two-Factor Downside Local Beta Estimates across Sectors from 2001 to 2008

Figure 4.7 Two-Factor Global Beta Estimates across Sectors from 2001 to 2008

Figure 4.8 Two-Factor Downside Global Beta Estimates across Sectors from 2001 to 2008
Figure 4.9 Semi-Deviation Estimates across Sectors from 2001 to 2008

Figure 4.10 Standard Deviation Estimates across Sectors from 2001 to 2008
Table 4.10: Average of the Firm Risk Measures by Sector

<table>
<thead>
<tr>
<th>Risk Measure</th>
<th>Construction</th>
<th>Consumer Products</th>
<th>Industrial Products</th>
<th>Plantations</th>
<th>Properties</th>
<th>Technology</th>
<th>Trading/Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\beta_i$</td>
<td>1.1643</td>
<td>0.7842</td>
<td>0.9918</td>
<td>0.9820</td>
<td>1.3048</td>
<td>1.0549</td>
<td>1.0255</td>
</tr>
<tr>
<td>$\beta^D_i$</td>
<td>1.8102</td>
<td>1.3700</td>
<td>1.7002</td>
<td>1.4531</td>
<td>1.8984</td>
<td>1.6803</td>
<td>1.5587</td>
</tr>
<tr>
<td>$\beta^G_i$</td>
<td>0.4170</td>
<td>0.2063</td>
<td>0.2928</td>
<td>0.2926</td>
<td>0.4087</td>
<td>0.4725</td>
<td>0.2867</td>
</tr>
<tr>
<td>$\beta^{DG}_i$</td>
<td>1.4196</td>
<td>1.0066</td>
<td>1.3140</td>
<td>1.0243</td>
<td>1.4092</td>
<td>1.2780</td>
<td>1.2042</td>
</tr>
<tr>
<td>$\beta_{Li}$</td>
<td>1.1365</td>
<td>0.7870</td>
<td>0.9908</td>
<td>0.9820</td>
<td>1.3000</td>
<td>0.9937</td>
<td>1.0262</td>
</tr>
<tr>
<td>$\beta_{Gi}$</td>
<td>0.0732</td>
<td>-0.0142</td>
<td>0.0008</td>
<td>-0.0016</td>
<td>0.0192</td>
<td>0.1891</td>
<td>-0.0097</td>
</tr>
<tr>
<td>$\beta^D_{Li}$</td>
<td>1.4405</td>
<td>1.0553</td>
<td>1.3793</td>
<td>1.1526</td>
<td>1.6101</td>
<td>1.3147</td>
<td>1.2078</td>
</tr>
<tr>
<td>$\beta^D_{Gi}$</td>
<td>0.6910</td>
<td>0.4970</td>
<td>0.6328</td>
<td>0.4401</td>
<td>0.6457</td>
<td>0.6725</td>
<td>0.5909</td>
</tr>
<tr>
<td>$\delta_{K_i}$</td>
<td>4.2862</td>
<td>3.4668</td>
<td>4.2608</td>
<td>3.2466</td>
<td>4.5511</td>
<td>3.9804</td>
<td>3.8352</td>
</tr>
<tr>
<td>$\sigma_i$</td>
<td>6.2906</td>
<td>5.0177</td>
<td>6.2079</td>
<td>4.9667</td>
<td>6.7582</td>
<td>5.7271</td>
<td>5.6688</td>
</tr>
</tbody>
</table>

Notes: The risk measures are as depicted in equations (3.2a), (3.3a), (3.4a), (3.5a), (3.6a), (3.7a), (3.8a) and (3.9a).
4.3 Estimates of the Cost of Equity and Their Properties

Before we proceed to select the best risk measure, perhaps it is best to examine the cost of equity generated from all risk measures across the eight different cost-of-equity models. With 354 sample firms and eight variations of cost of equity measures, we calculated a total of: (354 firms) \(\times\) (8 years) \(\times\) (8 risk measures) = 22,656 observations of annual firm-level cost of equity, and this amounts to a total of: (354 firms) \(\times\) (8 risk measures) = 2,832 series of firm-level cost of equity.

Table 4.11 reports the averages of the calculated cost of equity for the full sample from 2001 to 2008. Among the one-factor models, the GCAPM appears to produce the lowest cost of equity figures. The model postulates that the global market portfolio is the only priced risk factor to be considered in cost of equity estimation. The global equity market portfolio is considered the optimum market portfolio where the risk is at its lowest possible value without compromising return. Therefore, the calculated cost of equity should end up with a lower figure to justify the lower risk.

The opposite is observed for the downside CAPM models. The calculated costs of equity are generally higher than those obtained from the standard CAPM models. This result is in line with Estrada (2002, 2007) who also found higher cost of equity estimates when using downside beta. As for the non-CAPM-based models, cost of equity calculated based on STD is the highest. This is expected as STD measures the total risk. The calculation based on SMSTD produces cost of equity figures that are in between the high figures from the STD and the low figures generated by the CAPM. The results provide support for the argument by Estrada (2000, 2001) that advocated the downside risk models since they produce estimates of cost of equity that are halfway between the ‘rather low’ figures produced by the systematic risk approach (standard
beta) and the higher figures generated by the total risk (standard deviation or STD) method.

The results from the two-factor models revealed that the 2F-CAPM produces cost of equity values that are slightly higher than those from the GCAPM. The difference in the cost of equity figures generated from both models is rarely more than one percent. Although the cost of equity figures obtained from the 2F-CAPM is higher than those from the GCAPM, these figures are lower than those calculated from the LCAPM. This observation concurs with the rationale that since the 2F-CAPM is suitable for partially integrated economies as opposed to fully segmented markets (the LCAPM) at one end and fully integrated markets (the GCAPM) at the other extreme, the calculated cost of equity should reflect a figure between the two latter models. However, the same observation does not apply to their downside counterparts. Since the calculation of downside betas for the 2F-DCAPM involves isolating instances when the firm and the local market index returns as well as the global market index returns are less than zero, the generated downside series are relatively smaller. This could have caused the inconsistencies in the results observed for the downside version.

Further analysis is conducted on the calculated cost of equity at the sectoral level and the results are presented from Tables 4.12 to 4.18. Table 4.12 reports the annual average of calculated cost of equity figures for the Construction sector. The results show that the cost of equity figures in 2008 are lower than in 2001 for the CAPM models, that is, LCAPM, GCAPM, DLCAPM, DGCAPM, 2F-CAPM and 2F-DCAPM. The non-CAPM estimations, that is, SMSTD and STD, show that the calculated cost of equity has increased in 2008 as compared to 2001. Such an observation could be linked to an increase in unsystematic risks for firms in the Construction sector. Another interesting
finding is that the cost of equity figures based on SMSTD and STD are exceptionally high in 2001 and 2008, where the Dot.Com bubble and the U.S. subprime crisis took effect. This could mean that the Construction sector is highly susceptible to adverse factors from outside the country and considering that the cost of equity is higher in 2008 than in 2001, probably the U.S. subprime crisis has a greater impact on this sector.

On the contrary, the impact of the U.S. subprime crisis seems to be less on the Consumer Products sector (Table 4.13) and the Trading/Services sector (Table 4.18). In fact, these two sectors recorded higher costs of equity in 2001 when the Dot.Com bubble burst. This is understandable as firms in the Consumer Products sector and the Trading/Services sector probably have closer link to internet-related firms than the property firms. Other sectors including Industrial Products (Table 4.14), Properties (Table 4.16) and Technology (Table 4.17), do not show clear indication as the SMSTD cost of equity increased in 2008 but STD indicates otherwise. Nonetheless, the costs of equity calculated via the CAPM models have lower figures in 2008 than in 2001. The Plantation sector, as always, gives a slightly different view. Costs of equity calculated from the LCAPM and the DLCAPM are shown to be higher instead of lower in 2008 than in 2001. In sum, cost of equity differs across sectors, not only in figures but also in trend. Crises are also found to have different degree of impact on different sectors.
### Table 4.11: Annual Averages of the Calculated Cost of Equity for Full Sample

<table>
<thead>
<tr>
<th>Model</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>2F-CAPM</td>
<td>8.7003</td>
<td>5.3711</td>
<td>5.0736</td>
<td>3.4743</td>
<td>4.9931</td>
<td>8.5080</td>
<td>7.2568</td>
<td>5.5150</td>
</tr>
<tr>
<td>STD</td>
<td>43.8434</td>
<td>26.6176</td>
<td>31.1744</td>
<td>25.5566</td>
<td>28.3239</td>
<td>33.5355</td>
<td>35.7426</td>
<td>40.9918</td>
</tr>
</tbody>
</table>

Notes: The models are as depicted in equations (3.2), (3.3), (3.4), (3.5), (3.6), (3.7), (3.8) and (3.9).

### Table 4.12: Annual Averages of the Calculated Cost of Equity for Construction Sector

<table>
<thead>
<tr>
<th>Model</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>GCAPM</td>
<td>8.4965</td>
<td>4.5584</td>
<td>3.4817</td>
<td>3.0962</td>
<td>5.4960</td>
<td>11.0375</td>
<td>9.0082</td>
<td>5.6497</td>
</tr>
<tr>
<td>2F-CAPM</td>
<td>8.0632</td>
<td>5.0555</td>
<td>4.1657</td>
<td>2.8508</td>
<td>5.4732</td>
<td>10.0107</td>
<td>6.8168</td>
<td>5.6660</td>
</tr>
<tr>
<td>SMSTD</td>
<td>32.9946</td>
<td>20.2436</td>
<td>20.1012</td>
<td>20.7443</td>
<td>22.8013</td>
<td>23.4835</td>
<td>25.8758</td>
<td>37.0162</td>
</tr>
<tr>
<td>STD</td>
<td>45.4901</td>
<td>28.2172</td>
<td>32.9091</td>
<td>26.0961</td>
<td>27.6657</td>
<td>35.7854</td>
<td>39.4997</td>
<td>46.3849</td>
</tr>
</tbody>
</table>

Notes: The models are as depicted in equations (3.2), (3.3), (3.4), (3.5), (3.6), (3.7), (3.8) and (3.9).
### Table 4.13: Annual Averages of the Calculated Cost of Equity for Consumer Products Sector

<table>
<thead>
<tr>
<th>Model</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>STD</td>
<td>37.8240</td>
<td>23.3909</td>
<td>26.9808</td>
<td>23.5951</td>
<td>25.9902</td>
<td>30.6928</td>
<td>29.0852</td>
<td>34.3097</td>
</tr>
</tbody>
</table>

Notes: The models are as depicted in equations (3.2), (3.3), (3.4), (3.5), (3.6), (3.7), (3.8) and (3.9).

### Table 4.14: Annual Averages of the Calculated Cost of Equity for Industrial Products Sector

<table>
<thead>
<tr>
<th>Model</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>2F-CAPM</td>
<td>8.9471</td>
<td>5.4057</td>
<td>5.3736</td>
<td>3.2703</td>
<td>5.2325</td>
<td>8.3944</td>
<td>7.3832</td>
<td>5.4580</td>
</tr>
<tr>
<td>STD</td>
<td>44.9634</td>
<td>27.0305</td>
<td>32.9527</td>
<td>26.3536</td>
<td>30.0135</td>
<td>35.5089</td>
<td>38.1967</td>
<td>43.7545</td>
</tr>
</tbody>
</table>

Notes: The models are as depicted in equations (3.2), (3.3), (3.4), (3.5), (3.6), (3.7), (3.8) and (3.9).
Table 4.15: Annual Averages of the Calculated Cost of Equity for Plantation Sector

<table>
<thead>
<tr>
<th>Model</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>GCAPM</td>
<td>8.3003</td>
<td>4.3450</td>
<td>2.9520</td>
<td>2.8011</td>
<td>5.2440</td>
<td>8.9936</td>
<td>7.9456</td>
<td>5.3951</td>
</tr>
<tr>
<td>2F-CAPM</td>
<td>8.6837</td>
<td>5.3336</td>
<td>4.1728</td>
<td>3.1471</td>
<td>5.8330</td>
<td>8.8488</td>
<td>6.9129</td>
<td>6.5800</td>
</tr>
</tbody>
</table>

Notes: The models are as depicted in equations (3.2), (3.3), (3.4), (3.5), (3.6), (3.7), (3.8) and (3.9).

Table 4.16: Annual Averages of the Calculated Cost of Equity for Properties Sector

<table>
<thead>
<tr>
<th>Model</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>2F-CAPM</td>
<td>10.0511</td>
<td>6.0288</td>
<td>5.9374</td>
<td>4.0041</td>
<td>5.7367</td>
<td>10.0004</td>
<td>7.3879</td>
<td>5.8234</td>
</tr>
<tr>
<td>SMSTD</td>
<td>35.1133</td>
<td>22.0601</td>
<td>23.4510</td>
<td>19.4726</td>
<td>25.6963</td>
<td>24.4814</td>
<td>27.3170</td>
<td>35.9784</td>
</tr>
<tr>
<td>STD</td>
<td>48.7099</td>
<td>30.3726</td>
<td>37.7119</td>
<td>28.5849</td>
<td>32.2084</td>
<td>35.7567</td>
<td>42.3131</td>
<td>44.5824</td>
</tr>
</tbody>
</table>

Notes: The models are as depicted in equations (3.2), (3.3), (3.4), (3.5), (3.6), (3.7), (3.8) and (3.9).
Table 4.17: Annual Averages of the Calculated Cost of Equity for Technology Sector

<table>
<thead>
<tr>
<th>Model</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMSTD</td>
<td>32.7575</td>
<td>19.4465</td>
<td>17.5384</td>
<td>17.0894</td>
<td>20.1718</td>
<td>27.0316</td>
<td>23.6117</td>
<td>33.8085</td>
</tr>
<tr>
<td>STD</td>
<td>47.7304</td>
<td>26.9556</td>
<td>28.1626</td>
<td>20.9378</td>
<td>23.2546</td>
<td>39.7968</td>
<td>33.2539</td>
<td>40.4912</td>
</tr>
</tbody>
</table>

Notes: The models are as depicted in equations (3.2), (3.3), (3.4), (3.5), (3.6), (3.7), (3.8) and (3.9).

Table 4.18: Annual Averages of the Calculated Cost of Equity for Trading/Services Sector

<table>
<thead>
<tr>
<th>Model</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>2F-CAPM</td>
<td>8.7797</td>
<td>5.5297</td>
<td>5.2774</td>
<td>4.0576</td>
<td>4.5299</td>
<td>8.1903</td>
<td>7.6327</td>
<td>5.6544</td>
</tr>
</tbody>
</table>

Notes: The models are as depicted in equations (3.2), (3.3), (3.4), (3.5), (3.6), (3.7), (3.8) and (3.9).

Table 4.19 shows the averages of the calculated cost of equity across sectors for the different models. It seems that none of the models produce consistently the highest or
lowest cost for equity for a particular sector. For example, cost of equity calculated from the LCAPM, DLCAPM, 2F-DCAPM, SMSTD, and STD indicate that the Properties sector has the highest figures while the GCAPM and 2F-CAPM based costs of equity are the highest for the Technology sector. On the other hand, according to the DGCAPM, calculated cost of equity is highest for the Construction sector. Nonetheless, most models agree that the Consumer Products sector has the lowest cost of equity. An exception is found for the SMSTD and STD, whereby, according to these two models, the Plantations sector has the lowest cost of equity. Overall, the results found for cost of equity are consistent with those from the risk measures in that the Properties sector is among the riskiest while Consumer Products scores as one of the least risky sectors.
Table 4.19: Averages of the Calculated Cost of Equity by Sector

<table>
<thead>
<tr>
<th>Model</th>
<th>Consumer Products</th>
<th>Industrial Products</th>
<th>Plantations</th>
<th>Properties</th>
<th>Technology</th>
<th>Trading/Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>GCAPM</td>
<td>6.3530</td>
<td>5.3156</td>
<td>5.7484</td>
<td>5.7471</td>
<td>6.3232</td>
<td>6.6309</td>
</tr>
<tr>
<td>STD</td>
<td>35.2560</td>
<td>28.9836</td>
<td>34.8467</td>
<td>28.7735</td>
<td>37.5300</td>
<td>32.5729</td>
</tr>
</tbody>
</table>

Notes: The models are as depicted in equation (3.2), (3.3), (3.4), (3.5), (3.6), (3.7), (3.8) and (3.9).
4.4 Correlations of Cost of Equity

Correlation coefficients are calculated and paired-sample tests of equality-in-mean are carried out to ascertain whether the calculated cost of equity is significantly different across models (3.2) through (3.9). The results are displayed in Table 4.20. The upper diagonal of Table 4.20 reports the t-statistics for equality-in-mean. All 28 pair-wise mean differences in the calculated cost of equity from different models are significant at 1% level. The lower diagonal of Table 4.20 reports the correlation values. The pair-wise correlations between the pooled series of all the costs of equity are all below 0.7, except for three cases, that is, between the GCAPM and 2F-CAPM, the DGCAPM and 2F-DCAPM and, the SMSTD and STD.

With the established evidence of significant differences in the calculated cost of equity from the different models, the next step is to examine the explanatory power of the risk measures on the actual returns. We believe risk measures that have good explanatory power are also better measures for the calculation of cost of equity.

4.5 Selection of the Best Fit Risk Measure

A pooled regression analysis is estimated where actual returns of all the firms are regressed on each of the different risk measures and the explanatory power of the estimated models is compared. The risk measure with the highest $R^2$ and adjusted $R^2$ is considered to yield the best model.

Table 4.21 reports the $R^2$ and adjusted $R^2$ figures for the different risk measures according to sectors. It appears that the $R^2$ and adjusted $R^2$ figures do not differ much between the LCAPM, GCAPM 2F-CAPM and their downside risk model counterparts. In most instances, the standard CAPM models have higher explanatory power than their
downside models counterparts, except for the GCAPM in four sectors (Construction, Industrial Products, Plantations and Trading/Services) and 2F-CAPM in the Industrial Products sector and the Plantations sector. It is also shown by four out of seven sectors that the two-factor model, which considers both local and global risk factors, has higher explanatory power than the models that consider only a single risk factor. Based on the average rankings from the selection criteria, the semi-deviation approach is ranked one and therefore, yields the best model. This model explains about 40 percent of variations in stock returns and for some sectors, the figure goes up to more than 50 percent. The implication from this is that practitioners should move away from using the traditional modern finance approach of using the CAPM for calculating the cost of equity. They should shift to using downside risk measures or specifically the semi-deviation.

Before proceeding to the determinant of cost of equity analysis, we examine the costs of equity estimated from SMSTD across the various sectors as shown in Table 4.22. Basically, declining cost of equity is observed from year 2001 to 2004 across sectors. This finding is consistent with Ameer (2007) whereby, using 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 have 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 continues into 2008. For the Construction sector, the Industrial Products sector, the Plantations sector, the Properties sector and the Technology sector, their costs of equity in 2008 are the highest along the sample period. More often than not, the Properties sector is 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. Not only that, the price of steel bars was revised upwards three times in
April 2007, June 2007 and December 2007 by a total of 45 percent. On the other hand, the Plantations sector is shown to have 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 among all.

4.6 Concluding Remarks

This chapter examines the estimates of risk measures based on eight different models and the costs of equity calculated using these risk measures. Although some consistency in results is observed across sectors, deviations are also found. This justifies the need for an analysis on a sectoral basis. Model selection based on the goodness-of-fit criteria, that is, $R^2$ and adjusted $R^2$, selected the non-CAPM-based downside risk approach, the SMSTD, as the method with the best fit. This finding is consistent with Estrada’s (2000, 2001). The SMSTD will be used for the analysis which will be reported in the subsequent chapter.
Table 4.20: Correlation Coefficients and Paired T-Tests for Equality of the Calculated Cost of Equity

<table>
<thead>
<tr>
<th>Model</th>
<th>LCAPM</th>
<th>GCAPM</th>
<th>DLCAPM</th>
<th>DGCAPM</th>
<th>2F-CAPM</th>
<th>2F-DCAPM</th>
<th>SMSTD</th>
<th>STD</th>
</tr>
</thead>
<tbody>
<tr>
<td>LCAPM</td>
<td>-</td>
<td>44.3305***</td>
<td>-25.2255***</td>
<td>3.2977***</td>
<td>42.5039***</td>
<td>9.9562***</td>
<td>-56.2004***</td>
<td>-71.1748***</td>
</tr>
<tr>
<td>GCAPM</td>
<td>0.4763***</td>
<td>-</td>
<td>-64.7544***</td>
<td>28.5685***</td>
<td>-3.6038***</td>
<td>-32.7104***</td>
<td>-81.2762***</td>
<td>-89.3771***</td>
</tr>
<tr>
<td>DLCAPM</td>
<td>0.6193***</td>
<td>0.2214***</td>
<td>-</td>
<td>28.5685***</td>
<td>63.4137***</td>
<td>33.8427***</td>
<td>-37.5406***</td>
<td>-57.0077***</td>
</tr>
<tr>
<td>DGCAPM</td>
<td>0.5266***</td>
<td>0.4633***</td>
<td>0.6932***</td>
<td>-</td>
<td>40.2588***</td>
<td>6.9329***</td>
<td>-58.5328***</td>
<td>-72.8900***</td>
</tr>
<tr>
<td>2F-CAPM</td>
<td>0.5630***</td>
<td>0.9545***</td>
<td>0.2632***</td>
<td>0.4511***</td>
<td>-</td>
<td>-30.6343***</td>
<td>-80.3321***</td>
<td>-88.6278***</td>
</tr>
<tr>
<td>2F-DCAPM</td>
<td>0.4273***</td>
<td>0.3551***</td>
<td>0.5596***</td>
<td>0.8237***</td>
<td>0.3823***</td>
<td>-</td>
<td>-61.8841***</td>
<td>-75.4178***</td>
</tr>
<tr>
<td>SMSTD</td>
<td>0.4167***</td>
<td>0.2171***</td>
<td>0.5347***</td>
<td>0.4508***</td>
<td>0.2531***</td>
<td>0.3822***</td>
<td>-</td>
<td>-24.8577***</td>
</tr>
<tr>
<td>STD</td>
<td>0.4794***</td>
<td>0.2560***</td>
<td>0.5502***</td>
<td>0.4993***</td>
<td>0.2910***</td>
<td>0.4132***</td>
<td>0.9424***</td>
<td>-</td>
</tr>
</tbody>
</table>

Note: The upper diagonal results are the paired t-tests on equality in mean; the lower diagonal values are the correlation coefficients. The symbol *** denotes significance at 1% level. The models are as depicted in equations (3.2), (3.3), (3.4), (3.5), (3.6), (3.7), (3.8) and (3.9).
Table 4.21: Model Selection Based on Goodness-of-Fit Criteria

<table>
<thead>
<tr>
<th>Model</th>
<th>Construction</th>
<th>Consumer Products</th>
<th>Industrial Products</th>
<th>Plantations</th>
<th>Properties</th>
<th>Technology</th>
<th>Trading/Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panel A: R²</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>LCAPM</td>
<td>0.5853</td>
<td>0.3086</td>
<td>0.4109</td>
<td>0.6589</td>
<td>0.5565</td>
<td>0.5532</td>
<td>0.3819</td>
</tr>
<tr>
<td>GCAPM</td>
<td>0.5735</td>
<td>0.3032</td>
<td>0.4118</td>
<td>0.6560</td>
<td>0.5814</td>
<td>0.5815</td>
<td>0.3873</td>
</tr>
<tr>
<td>DLCAPM</td>
<td>0.5753</td>
<td>0.3008</td>
<td>0.4088</td>
<td>0.6552</td>
<td>0.5550</td>
<td>0.5523</td>
<td>0.3738</td>
</tr>
<tr>
<td>DGCAPM</td>
<td>0.5744</td>
<td>0.3008</td>
<td>0.4131</td>
<td>0.6679</td>
<td>0.5527</td>
<td>0.5537</td>
<td>0.3946</td>
</tr>
<tr>
<td>2F-CAPM</td>
<td>0.5973</td>
<td>0.3322</td>
<td>0.4132</td>
<td>0.6591</td>
<td>0.5732</td>
<td><strong>0.5958</strong></td>
<td>0.3865</td>
</tr>
<tr>
<td>2F-DCAPM</td>
<td>0.5968</td>
<td>0.3135</td>
<td>0.4179</td>
<td>0.6611</td>
<td>0.5608</td>
<td>0.5564</td>
<td>0.3838</td>
</tr>
<tr>
<td>SMSTD</td>
<td><strong>0.6148</strong></td>
<td><strong>0.3735</strong></td>
<td><strong>0.4290</strong></td>
<td>0.6646</td>
<td>0.5917</td>
<td><strong>0.4263</strong></td>
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</tr>
<tr>
<td>STD</td>
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<td>0.3007</td>
<td>0.4249</td>
<td>0.6804</td>
<td>0.5522</td>
<td>0.3771</td>
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<tr>
<td>Panel B: Adjusted R²</td>
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<tr>
<td>LCAPM</td>
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<td>0.1946</td>
<td>0.3214</td>
<td>0.5902</td>
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<td>0.4415</td>
<td>0.2842</td>
</tr>
<tr>
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<td>0.1883</td>
<td>0.3224</td>
<td>0.5867</td>
<td><strong>0.5063</strong></td>
<td>0.4769</td>
<td>0.2904</td>
</tr>
<tr>
<td>DLCAPM</td>
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<td>0.3189</td>
<td>0.5858</td>
<td>0.4752</td>
<td>0.4404</td>
<td>0.2747</td>
</tr>
<tr>
<td>DGCAPM</td>
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<td>0.1856</td>
<td>0.3239</td>
<td>0.6010</td>
<td>0.4725</td>
<td>0.4422</td>
<td>0.2988</td>
</tr>
<tr>
<td>2F-CAPM</td>
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<td>0.2179</td>
<td>0.3225</td>
<td>0.5845</td>
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<td>0.4811</td>
<td>0.2868</td>
</tr>
<tr>
<td>2F-DCAPM</td>
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<td>0.1960</td>
<td>0.3279</td>
<td>0.5869</td>
<td>0.4773</td>
<td>0.4305</td>
<td>0.2837</td>
</tr>
<tr>
<td>SMSTD</td>
<td><strong>0.5431</strong></td>
<td><strong>0.2702</strong></td>
<td><strong>0.3423</strong></td>
<td>0.5970</td>
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<tr>
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<td>0.1854</td>
<td>0.3375</td>
<td>0.6160</td>
<td>0.4851</td>
<td>0.4402</td>
<td>0.2785</td>
</tr>
</tbody>
</table>

Notes: The models are as depicted in equations (3.2), (3.3), (3.4), (3.5), (3.6), (3.7), (3.8) and (3.9).
<table>
<thead>
<tr>
<th>Year</th>
<th>Construction</th>
<th>Consumer Products</th>
<th>Industrial Products</th>
<th>Plantations</th>
<th>Properties</th>
<th>Technology</th>
<th>Trading/Services</th>
<th>Full Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
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<td>28.2023</td>
<td>33.3705</td>
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<td>27.1760</td>
<td>33.8079</td>
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<td>35.9784</td>
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