Prediction of operating cash flows using accrual-based and cash-based accounting information among Malaysian industrial corporations

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Prediction Of Operating Cash Flows Using Accrual-Based And Cash-Based Accounting Information Among Malaysian Industrial Corporations

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A thesis submitted to the Southern Cross Business School of Southern Cross University, Australia, in partial fulfilment of the degree of Doctor of Business Administration
December 2011
STATEMENT OF ORIGINAL AUTHORSHIP

I certify that the work presented in this thesis is, to the best of my knowledge and belief, original, except as acknowledged in the text, and that the material has not been submitted, either in whole or in part, for a degree at this or any other university.

I acknowledge that I have read and understood the University's rules, requirements, procedures and policy relating to my higher degree research award and to my thesis. I certify that I have complied with the rules, requirements, procedures and policy of the University (as they may be from time to time).

Signed:  ………………………    Date: ..…….………………..

Chong Ki Woi (James)
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ABSTRACT

This study investigated the comparative abilities of accrual-based and cash-based accounting information for future operating cash flows prediction. It aimed to explain the extent earnings, accruals, EBITDA and operating cash flows are able to predict listed Malaysian industrial products manufacturing corporations’ operating cash flows. Ordinary least squares method was used to develop fifteen multiple linear regression models in examining up to three years of prediction horizon. Current operating cash flows, as proxy for future operating cash flows, are regressed on past one, two and three years of earnings, operating cash flows, operating cash flows combined with aggregated/disaggregated accruals and EBITDA as predictors. The sample was collected from annual financial statements of 97 listed corporations from 1999 to 2009 (11 years) and categorised into two subsamples; the within sample (1999 to 2008) to develop the models and the holdout sample (2009) to validate the robustness of the models.

Results from the regression analyses revealed that all the accounting measures examined have significant predictive abilities but differing powers. Earnings are superior to operating cash flows but EBITDA are stronger than both earnings and operating cash flows while the operating cash flows have the weakest predictive powers. The model comprising of both operating cash flows and disaggregated accrual components have the strongest predictive abilities. This suggests that disaggregating earnings into operating cash flows and accruals and further decomposing the aggregated accruals into the individual accrual components enhance the predictive abilities. These findings revealed that accruals have incremental explanatory powers beyond that contained in operating cash flows and disaggregated accrual components provided incremental explanatory powers exceeding that provided by aggregated accruals. Aggregated earnings masked the contributions of each accrual component. Disaggregating earnings and further decomposing the aggregated accruals unmask the contributions and effects of each accrual component. As individual predictors, both earnings and accruals have the significant abilities to predict future operating cash flows for only one year-ahead (short term), EBITDA can predict up to two years-ahead (medium term) and operating cash flows can predict up to three years-ahead (long term).
ABBREVIATIONS

ACR  Aggregated accruals
AP   Accounts payable changes
AR   Accounts receivable changes
ASB  Accounting Standards Board
CBRS Capital Market Development Fund-Bursa Malaysia Research Scheme
CFO  Cash flow from operating activities
CODE Malaysian Code on Corporate Governance
DEPRM Depreciation and amortisation expense
EARN Earnings after tax but before extraordinary items and discontinued operations.
EBITDA Earnings before interest, tax, depreciation and amortization
FASB Financial Accounting Standards Board
FRS  Financial Reporting Statement
IASB International Accounting Standards Board
IASC International Accounting Standards Committee
INV Inventory changes
MASB Malaysian Accounting Standards Board
MDA Multiple Discriminant Analysis
MIA  Malaysian Institute of Accountants
OTH Other accruals changes
SC  Securities Commission Malaysia
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Statement of Original Authorship</td>
<td>ii</td>
</tr>
<tr>
<td>Acknowledgments</td>
<td>iii</td>
</tr>
<tr>
<td>Abstract</td>
<td>iv</td>
</tr>
<tr>
<td>Abbreviations</td>
<td>v</td>
</tr>
<tr>
<td>Table of Contents</td>
<td>vi</td>
</tr>
<tr>
<td>List of Figures</td>
<td>xiv</td>
</tr>
<tr>
<td>List of Tables</td>
<td>xv</td>
</tr>
<tr>
<td>Chapter 1: Introduction to the Research</td>
<td>1</td>
</tr>
<tr>
<td>1.1 Introduction</td>
<td>1</td>
</tr>
<tr>
<td>1.2 Research Background</td>
<td>3</td>
</tr>
<tr>
<td>1.3 Research Problem, Research Questions, Hypotheses and Objectives</td>
<td>8</td>
</tr>
<tr>
<td>1.3.1 Research problem</td>
<td>8</td>
</tr>
<tr>
<td>1.3.2 Research questions</td>
<td>8</td>
</tr>
<tr>
<td>1.3.3 Research hypotheses</td>
<td>9</td>
</tr>
<tr>
<td>1.3.4 Research objectives</td>
<td>10</td>
</tr>
<tr>
<td>1.4 Justifications and Contributions of this Research</td>
<td>11</td>
</tr>
<tr>
<td>1.5 Research Design</td>
<td>17</td>
</tr>
<tr>
<td>1.6 Model Building</td>
<td>19</td>
</tr>
<tr>
<td>1.7 Data Collection and Analysis</td>
<td>21</td>
</tr>
<tr>
<td>1.8 Outline of the Thesis</td>
<td>22</td>
</tr>
<tr>
<td>1.9 Definitions</td>
<td>23</td>
</tr>
<tr>
<td>1.10 Delimitations of Scope</td>
<td>24</td>
</tr>
<tr>
<td>1.11 Conclusion</td>
<td>25</td>
</tr>
</tbody>
</table>
Chapter 2: Literature Review

2.1 Introduction ........................................................................................................... 26

2.2 Background and Development of Bursa Malaysia and Financial Reporting Regulations in Malaysia.................................................. 29

   2.2.1 Bursa Malaysia background and developments................................. 29

   2.2.2 Malaysian financial reporting regulations background and developments................................................................. 32

2.3 Importance of Future Cash Flows Prediction................................................. 39

   2.3.1 Investment appraisal................................................................. 39

   2.3.2 Securities valuation ................................................................. 40

   2.3.3 Long term versus short term investment perspective.......................... 41

   2.3.4 Credit evaluation................................................................. 43

   2.3.5 Facilitate decision making by investors.............................................. 43

2.4 Parent Disciplines: Accrual and Cash Accounting................................. 45

   2.4.1 Accrual accounting ................................................................. 45

      2.4.1.1 Revenue recognition and matching principles................. 46

      2.4.1.2 Assets and liabilities arising from accrual accounting 47

      2.4.1.3 Historical cost convention.......................................... 49

      2.4.1.4 Going concern principle.............................................. 50

      2.4.1.5 Earnings composition: operating cash flows and accruals................................................................. 51

      2.4.1.6 Accrual-based is more subjective than cash-based accounting information................................................................. 52

   2.4.2 Cash accounting ................................................................. 53

      2.4.2.1 Objective nature of cash flow information................. 54

      2.4.2.2 Cash flow statement accounting standard in Malaysia 55

      2.4.2.3 Timing and matching issues with cash accounting .... 58
### 2.3.2.4 Cash accounting is less comprehensive than accrual accounting

#### 2.5 Immediate Discipline

2.5.1 Comparative abilities of earnings and operating cash flows in predicting future operating cash flows

2.5.1.1 Future operating cash flows proxies

2.5.1.2 Predictive ability of actual versus estimated operating cash flows

2.5.1.3 Multiple linear regression models as proxies for future operating cash flows prediction models

2.5.2 Comparative abilities of earnings, accruals and operating cash flows in predicting future operating cash flows

2.5.2.1 Research conducted in developed countries with large economies and mature capital markets

2.5.2.2 Research conducted in developing countries with smaller economies and emerging capital markets

2.6 Other Related Studies

2.6.1 Comparative abilities of accounting and operating cash flows information in explaining stock market returns

2.6.1.1 Comparative abilities of earnings and operating cash flows in explaining stock market returns

2.6.1.2 Comparative abilities of earnings, accruals and operating cash flows in explaining stock market returns

2.6.2 EBITDA as an alternative performance measurement for valuation purposes

2.6.3 Related prior studies within the Malaysian context

2.6.3.1 Accounting and cash flows information in explaining share market returns within the Malaysian context

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.3.2.4 Cash accounting is less comprehensive than accrual accounting</td>
<td>59</td>
</tr>
<tr>
<td>2.5 Immediate Discipline</td>
<td>61</td>
</tr>
<tr>
<td>2.5.1 Comparative abilities of earnings and operating cash flows</td>
<td>62</td>
</tr>
<tr>
<td>2.5.1.1 Future operating cash flows proxies</td>
<td>64</td>
</tr>
<tr>
<td>2.5.1.2 Predictive ability of actual versus estimated operating cash flows</td>
<td>65</td>
</tr>
<tr>
<td>2.5.1.3 Multiple linear regression models as proxies for future operating cash flows prediction models</td>
<td>67</td>
</tr>
<tr>
<td>2.5.2 Comparative abilities of earnings, accruals and operating cash flows in predicting future operating cash flows</td>
<td>69</td>
</tr>
<tr>
<td>2.5.2.1 Research conducted in developed countries with large economies and mature capital markets</td>
<td>71</td>
</tr>
<tr>
<td>2.5.2.2 Research conducted in developing countries with smaller economies and emerging capital markets</td>
<td>76</td>
</tr>
<tr>
<td>2.6 Other Related Studies</td>
<td>86</td>
</tr>
<tr>
<td>2.6.1 Comparative abilities of accounting and operating cash flows information in explaining stock market returns</td>
<td>86</td>
</tr>
<tr>
<td>2.6.1.1 Comparative abilities of earnings and operating cash flows in explaining stock market returns</td>
<td>87</td>
</tr>
<tr>
<td>2.6.1.2 Comparative abilities of earnings, accruals and operating cash flows in explaining stock market returns</td>
<td>89</td>
</tr>
<tr>
<td>2.6.2 EBITDA as an alternative performance measurement for valuation purposes</td>
<td>92</td>
</tr>
<tr>
<td>2.6.3 Related prior studies within the Malaysian context</td>
<td>93</td>
</tr>
<tr>
<td>2.6.3.1 Accounting and cash flows information in explaining share market returns within the Malaysian context</td>
<td>93</td>
</tr>
</tbody>
</table>
### 2.6.3.2 Predicting corporate distress studies in Malaysia

Page 95

### 2.6.4 Limitations in using share market returns as proxy for future operating cash flows

Page 98

### 2.7 Research Issues and Gaps

Page 99

#### 2.7.1 Contradictory evidence on comparative predictive abilities of historical earnings versus operating cash flows

Page 99

#### 2.7.2 Contradictory evidence on comparative predictive abilities of earnings, operating cash flows and operating cash flows combined with aggregated/disaggregated accruals

Page 100

#### 2.7.3 Limited empirical studies on the ability of EBITDA in predicting future operating cash flows

Page 101

#### 2.7.4 Pooling information across different industries: unreliable findings

Page 102

#### 2.7.5 Limited empirical studies within the Malaysian context

Page 102

### 2.8 Research Problem, Research Questions and Hypotheses

Page 104

#### 2.8.1 Research problem

Page 105

#### 2.8.2 Research questions

Page 106

##### 2.8.2.1 Earnings and operating cash flow as predictors of future operating cash flows

Page 106

##### 2.8.2.2 Operating cash flows combined with aggregated/disaggregated accrual components as predictors of future operating cash flows

Page 107

##### 2.8.2.3 EBITDA as predictor of future operating cash flows

Page 109

##### 2.8.2.4 Comparative abilities of accrual accounting information and operating cash flows information for future operating cash flows prediction

Page 110

#### 2.8.3 Research hypotheses and conceptual model development

Page 113

##### 2.8.3.1 Hypothesis 1

Page 113
2.8.3.2 Hypothesis 2 .............................. 115
2.8.3.3 Hypothesis 3 .............................. 117
2.8.3.4 Hypothesis 4 .............................. 119
2.8.3.5 Hypothesis 5 .............................. 122
2.8.3.6 Hypothesis 6 .............................. 123

2.9 Conclusion ......................................................... 125

Chapter 3: Methodology ........................................... 126
3.1 Introduction ......................................................... 126
3.2 Research Paradigm Justification ................................. 128
  3.2.1 Interpretivism .................................................. 128
  3.2.2 Critical theory ............................................... 130
  3.2.3 Realism ..................................................... 131
  3.2.4 Positivism .................................................. 132
3.3 Approaches in Accounting Research ............................. 136
  3.3.1 Descriptive pragmatic research ............................. 136
  3.3.2 Normative research ........................................... 138
  3.3.3 Positive accounting research ............................... 139
3.4 Research Design ................................................... 143
  3.4.1 Classifications of research .................................. 143
  3.4.2 Research objectives .......................................... 144
  3.4.3 Research methodology: quantitative versus qualitative .. 144
3.5 Conceptual Framework for Prediction Models Development ....... 147
3.6 Evaluating Other Statistical Techniques ........................ 149
3.7 Prediction Horizon .................................................. 150
3.8 Measurement of Variables ......................................... 151
  3.8.1 Independent variables (predictors) .......................... 152
    3.8.1.1 Earnings measurements ............................... 152
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.8.1.2 Operating cash flows measurements</td>
<td>153</td>
</tr>
<tr>
<td>3.8.1.3 Accruals measurement</td>
<td>154</td>
</tr>
<tr>
<td>3.8.1.4 Earnings before interest, tax, depreciation and amortization (EBITDA)</td>
<td>158</td>
</tr>
<tr>
<td>3.8.2 Dependent variable</td>
<td>159</td>
</tr>
<tr>
<td><strong>3.9 Regression Models Development</strong></td>
<td>159</td>
</tr>
<tr>
<td>3.9.1 Earnings model</td>
<td>160</td>
</tr>
<tr>
<td>3.9.2 Operating cash flows model</td>
<td>161</td>
</tr>
<tr>
<td>3.9.3 Operating cash flows model combined with aggregated accruals model</td>
<td>162</td>
</tr>
<tr>
<td>3.9.4 Operating cash flows combined with disaggregated accrual components model</td>
<td>163</td>
</tr>
<tr>
<td>3.9.5 EBITDA model</td>
<td>165</td>
</tr>
<tr>
<td><strong>3.10 Statistical Testing Techniques</strong></td>
<td>167</td>
</tr>
<tr>
<td>3.10.1 Regression assumptions</td>
<td>167</td>
</tr>
<tr>
<td>3.10.2 Evaluating the predictive ability and comparative strength of the models</td>
<td>169</td>
</tr>
<tr>
<td>3.10.3 Validation tests</td>
<td>170</td>
</tr>
<tr>
<td><strong>3.11 Data Collection</strong></td>
<td>171</td>
</tr>
<tr>
<td>3.11.1 Target population</td>
<td>172</td>
</tr>
<tr>
<td>3.11.2 Sampling methods</td>
<td>172</td>
</tr>
<tr>
<td>3.11.3 Secondary sources and research period</td>
<td>173</td>
</tr>
<tr>
<td>3.11.4 Data preparation</td>
<td>176</td>
</tr>
<tr>
<td>3.11.4.1 Data arrangement</td>
<td>176</td>
</tr>
<tr>
<td>3.11.4.2 Outliers</td>
<td>178</td>
</tr>
<tr>
<td>3.11.4.3 Normality tests</td>
<td>178</td>
</tr>
<tr>
<td>3.11.5 Descriptive statistics</td>
<td>179</td>
</tr>
<tr>
<td>3.11.6 Correlation evaluation</td>
<td>179</td>
</tr>
</tbody>
</table>
Chapter 5: Conclusions and Implications ........................................... 236

5.1 Introduction .................................................................................. 236

5.2 Conclusions about the Research Questions and Hypotheses ............. 239

   5.2.1 Hypothesis 1 ............................................................................. 239
   5.2.2 Hypothesis 2 ............................................................................. 243
   5.2.3 Hypothesis 3 ............................................................................. 246
   5.2.4 Hypothesis 4 ............................................................................. 250
   5.2.5 Hypothesis 5 ............................................................................. 255
   5.2.6 Hypothesis 6 ............................................................................. 258
   5.2.7 Validation of the regression models ........................................... 261

5.3 Conclusions about the Research Problem ........................................ 262

5.4 Implications for Theory .................................................................. 270

5.5 Implications for Policy and Practice ............................................. 274

5.6 Limitations .................................................................................... 277

5.7 Implications for Future Research .................................................. 278

5.8 Summary ...................................................................................... 278

References .......................................................................................... 280

Appendices ......................................................................................... 309

A Histograms of current year, one year lagged, two years lagged and three
   years lagged variables ................................................................. 309

B Skewness and Kurtosis statistical results to test normality of each
   variable .......................................................................................... 327

C Histogram of residuals from each regression model ............................ 328

D Scatter-plot graphs of standardised residuals plotted against standardised
   predicted values for each model .................................................. 336
<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>Chapter 1 Structure: Introduction to the Research</td>
<td>2</td>
</tr>
<tr>
<td>1.2</td>
<td>Research design overview</td>
<td>18</td>
</tr>
<tr>
<td>1.3</td>
<td>Prediction models</td>
<td>21</td>
</tr>
<tr>
<td>2.1</td>
<td>Chapter 2 Structure: Literature Review</td>
<td>28</td>
</tr>
<tr>
<td>2.2</td>
<td>Earnings model for future operating cash flows prediction</td>
<td>115</td>
</tr>
<tr>
<td>2.3</td>
<td>Operating cash flows model for future operating cash flows prediction</td>
<td>116</td>
</tr>
<tr>
<td>2.4</td>
<td>Operating cash flows combined with aggregated accrual model for future operating cash flows prediction</td>
<td>118</td>
</tr>
<tr>
<td>2.5</td>
<td>Operating cash flows combined with disaggregated accrual components model for future operating cash flows prediction</td>
<td>121</td>
</tr>
<tr>
<td>2.6</td>
<td>EBITDA model for future operating cash flows prediction</td>
<td>123</td>
</tr>
<tr>
<td>3.1</td>
<td>Chapter 3 Structure: Methodology</td>
<td>127</td>
</tr>
<tr>
<td>3.2</td>
<td>Main approaches in accounting theory development</td>
<td>136</td>
</tr>
<tr>
<td>4.1</td>
<td>Chapter 4 Structure: Data Analysis</td>
<td>186</td>
</tr>
<tr>
<td>5.1</td>
<td>Chapter 5 Structure: Conclusions and Implications</td>
<td>238</td>
</tr>
<tr>
<td>5.2</td>
<td>Key findings from testing hypothesis 1</td>
<td>242</td>
</tr>
<tr>
<td>5.3</td>
<td>Key findings from testing hypothesis 2</td>
<td>246</td>
</tr>
<tr>
<td>5.4</td>
<td>Key findings from testing hypothesis 3</td>
<td>250</td>
</tr>
<tr>
<td>5.5</td>
<td>Key findings from testing hypothesis 4</td>
<td>254</td>
</tr>
<tr>
<td>5.6</td>
<td>Key findings from testing hypothesis 5</td>
<td>257</td>
</tr>
</tbody>
</table>
# LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table 1.1</td>
<td>Abbreviations and the associated descriptions</td>
<td>23</td>
</tr>
<tr>
<td>Table 2.1</td>
<td>Key differences between accruals and cash accounting principles.</td>
<td>61</td>
</tr>
<tr>
<td>Table 2.2</td>
<td>Summary of prior studies on the comparative abilities of earnings and operating cash flows in predicting future operating cash flows</td>
<td>64</td>
</tr>
<tr>
<td>Table 2.3</td>
<td>Summary of prior studies on the comparative abilities of earnings, accruals and operating cash flows in predicting future operating cash flows</td>
<td>79</td>
</tr>
<tr>
<td>Table 2.4</td>
<td>Summary of prior studies on the comparative abilities of earnings and operating cash flows in explaining stock market returns</td>
<td>88</td>
</tr>
<tr>
<td>Table 3.1</td>
<td>Comparison between different paradigms and the associated elements</td>
<td>135</td>
</tr>
<tr>
<td>Table 3.2</td>
<td>Summary of pioneering positive accounting studies in chronological order</td>
<td>141</td>
</tr>
<tr>
<td>Table 3.3</td>
<td>Main differences between qualitative and quantitative research</td>
<td>146</td>
</tr>
<tr>
<td>Table 3.4</td>
<td>Length of research period examined by some prior studies</td>
<td>175</td>
</tr>
<tr>
<td>Table 3.5</td>
<td>Matching years for pooling data from the within sample for regression models development</td>
<td>177</td>
</tr>
<tr>
<td>Table 3.6</td>
<td>Matching years for pooling data to predict future operating cash flows</td>
<td>178</td>
</tr>
<tr>
<td>Table 4.1</td>
<td>Regression models summary</td>
<td>188</td>
</tr>
<tr>
<td>Table 4.2</td>
<td>Total number of firms included in the study</td>
<td>190</td>
</tr>
<tr>
<td>Table 4.3</td>
<td>Number of firms corresponding to each year</td>
<td>190</td>
</tr>
<tr>
<td>Table 4.4</td>
<td>Matching years for pooling accounting data</td>
<td>192</td>
</tr>
<tr>
<td>Table 4.5</td>
<td>Descriptive statistics of unscaled and scaled variables: pooled sample</td>
<td>196</td>
</tr>
</tbody>
</table>
Table 4.6  Correlation matrix for earnings (EARN), cash flow from
operations (CFO), aggregated accruals (ACR) and EBITDA
scaled by average total assets……………………………………200
Table 4.7 Correlation matrix for cash flow from operations (CFO) and
disaggregated accrual components, which are inventory changes
(INV), accounts receivable changes (AR), accounts payable
changes (AP), depreciation and amortisation (DEPRM) and other
accruals changes (OTH), scaled by average total assets………201
Table 4.8 Summary of regressing future operating cash flows on past
earnings…………………………………………………………205
Table 4.9 Summary of earnings model parameters……………………206
Table 4.10 Summary results from regressing future operating cash flows on
past operating cash flows……………………………………209
Table 4.11 Summary of operating cash flows model parameters………210
Table 4.12 Summary results from regressing future operating cash flows on
past operating cash flows combined with aggregated accruals….213
Table 4.13 Summary of operating cash flows combined with aggregated
accruals model parameters……………………………………215
Table 4.14 Summary results from regressing future operating cash flows
on past operating cash flows combined with disaggregated
accrual components…………………………………………218
Table 4.15 Summary of operating cash flows combined with
disaggregated accrual components model parameters………221
Table 4.16 Summary results from regressing future operating cash flows
on past EBITDA………………………………………………223
Table 4.17 Summary of EBITDA model parameters………………225
Table 4.18 Adjusted R² summary for all the regression models……228
Table 4.19 Ranking of the models’ predictive powers based on adjusted R²..229
Table 4.20  Summary of adjusted R² using Stein’s formula and adjusted R² from SPSS.......................................................... 231
Table 4.21  Summary of the correlation coefficient and adjusted R² from comparison between predicted and actual operating cash flows… 233
Table 5.1   Summary of the key findings and conclusions........................... 267
Synopsis/Brief Abstract:

This study investigated the comparative abilities of accrual-based and cash-based accounting information for future operating cash flows prediction. It aimed to explain the extent earnings, accruals, EBITDA and operating cash flows are able to predict listed Malaysian industrial products manufacturing corporations’ operating cash flows. Findings revealed that accruals have incremental explanatory powers beyond operating cash flows and disaggregated accrual components provide incremental explanatory powers exceeding aggregated accruals. As individual predictors, both earnings and accruals have the significant abilities to predict future operating cash flows for only one year-ahead, EBITDA can predict up to two years-ahead and operating cash flows can predict up to three years-ahead.
1.1 Introduction

This chapter provides an overview of the research background and research design for this study. There are eleven sections in this chapter. The introduction and outline of this chapter is described in section 1.1. Overview of the research background and extant literature pertaining to the research area are discussed in section 1.2. The research problem, the research questions, the hypotheses developed from reviewing extant literature and objectives are examined in section 1.3. The justifications and contributions of this study are described in section 1.4. The research design, paradigm and the methodology guiding this research are outlined in section 1.5. The regression models and variables developed for this study are demonstrated in section 1.6. The methods used to collect and analyse the data are discussed in section 1.7. The overall structure of this study is outlined in section 1.8. The key abbreviations used for this study are provided in section 1.9. The delimitations for the research scope are examined in section 1.10. The conclusion of this chapter is provided in section 1.11.

Figure 1.1 outlines the structure of this chapter.
Figure 1.1  Chapter 1 Structure: Introduction to the Research

<table>
<thead>
<tr>
<th>1.1 Introduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2 Research Background</td>
</tr>
<tr>
<td>1.3 Research Problem, Research Questions, Hypotheses and Objectives</td>
</tr>
<tr>
<td>1.4 Justifications and Contributions of this Research</td>
</tr>
<tr>
<td>1.5 Research Design</td>
</tr>
<tr>
<td>1.6 Model Building</td>
</tr>
<tr>
<td>1.7 Data Collection and Analysis</td>
</tr>
<tr>
<td>1.8 Outline of the Thesis</td>
</tr>
<tr>
<td>1.9 Definitions</td>
</tr>
<tr>
<td>1.10 Delimitations of Scope</td>
</tr>
<tr>
<td>1.11 Conclusion</td>
</tr>
</tbody>
</table>

Source: Developed for this study.
1.2 Research Background

Agency theory indicates that there is a separation of ownership and control, with managers appointed by owners (shareholders) to manage the company on their behalf (Deegan 2005; Jensen and Meckling 1976; Watson and Head 2007). The accounting information derived from the published financial statements is a crucial source of relevant information used for many purposes. Owners (shareholders) often use the reported financial information to assess the managers’ performance in discharging their stewardship responsibilities and for making economic decisions (Godfrey, Hodgson, Holmes and Tarca 2006).

The International Accounting Standard Board (IASB) and the Malaysian Accounting Standards Board (MASB) have also emphasised that an assessment of the enterprise’s ability, timing and certainty to generate future cash flows is essential when making economic decisions (IASB 2001, MASB 2007). A main objective of the financial statement is to enable users to examine the company’s ability to generate sustainable future cash flows for decision-making purposes (IASB 2001). Forecasting future cash flows is an important aspect of the economic decision making process, such as when valuating securities, appraising risk and returns of potential investments, assessing long term versus short term investments and conducting capital budgeting. These essential aspects of predicting future cash flows are grounded in financial theory. Share prices are estimated as equal to the present value of forecasted future (estimated) cash flows (Brigham, Gapenski and Ehrhardt 1999; Keown, Martin, Petty and Scott 2005; Watson and Head 2007). Various capital market studies, pioneered by Ball and Brown (1968), have supported this perspective by providing evidence that the company’s equity market valuation is significantly associated with reported earnings and operating cash flows (such as Ball and Brown 1968; Cotter 1996; Charitou, Clubb and Andreaou 2001; Dechow 1994; Guay and Sidhu 2001; Penham and Yehuda 2009; Pourheydari and Ahmadi 2008; Richardson, Sloan, Soliman and Tuna 2002; Sloan 1996).

Cash flow from operations provide an essential indicator on the firm’s ability to generate sustainable cash flows to repay and service liabilities, maintain operating activities, pay
dividends to investors and provide internal source of financing for investments (MASB 2010, paragraph 13). Operating cash flows are mainly resulted from the principal activities of the firm (MASB 2010, paragraph 14). The accounting standards do recognise that such information are useful in predicting future operating cash flows but only when used jointly with other relevant information (MASB 2010, paragraph 13). Accrual accounting basis is primarily the generally accepted accounting convention recommended when preparing financial statements instead of cash-based reporting (IASB 2001; MASB 2010). The Financial Accounting Standard Board (FASB) of the United States has emphasised that the information content reported under accrual accounting principles is superior to cash receipts and payments in assessing the company’s ability to generate sustainable cash flows (FASB 1978).

Despite numerous research in this area, extant literature on the comparative abilities of accrual-based earnings versus operating cash flows in predicting future operating cash flows are contradictory and inconclusive. Some prior studies (such as Charitou and Vafeas 1998; Ebaid 2011; Finger 1994; Kim and Kross 2005, Pae 2005) have revealed that historical earnings are better future operating cash flow predictors than historical operating cash flows. However, some prior studies have also documented that historical operating cash flows are superior to historical earnings in forecasting future operating cash flows (such as Farshadfar, Ng and Brimble 2008, Habib 2010; Penham and Yehuda 2009; Waldron and Jordan 2010). Moreover, no discernible differences between earnings and operating cash flows as predictors of future operating cash flows are reported by some previous studies (Arnold, Clubb, Manson and Wearing 1991; McBeth 1989; Pfeiffer, Elgers, Lo and Rees 1998).

Earnings or net income reported under the accrual accounting basis is a combination of cash flow from operations and accrual components (Dechow 1994; Dechow and Dichev 2002; Dechow, Richardson and Sloan 2008). The second major stream of studies examined the incremental explanatory abilities of accruals by disaggregating the earnings into the operating cash flows and accrual components of earnings and compared earnings, operating cash flows and operating cash flows combined with aggregated/disaggregated
accruals in predicting future operating cash flows (such as Al-Attar and Hussain 2004; Barth, Cram and Nelson 2001; Chotkunakitti 2005; Ebaid 2011; Stammerjohan and Nassiripour 2001; Supriyadi 1998). These prior studies have also reported conflicting findings. Some studies have documented that disaggregating earnings into the individual operating cash flows and aggregated accruals improves the predictive ability of earnings and further disaggregation of the accruals into the individual accrual components (such as accounts receivable changes, accounts payable changes, inventory changes, depreciation and amortisation expenses) enhance even more the predictive powers of earnings (Al-Attar and Hussain 2004; Barth et al. 2001; Ebaid 2011). However, prior research has also provided conflicting evidence that operating cash flows as a single predictor is superior to both earnings and operating cash flows combined with aggregated/disaggregated accruals (Chotkunakitti 2005) and some studies have reported no discernible difference between operating cash flows combined with accruals versus operating cash flows as a single predictor of future operating cash flows (Stammerjohan and Nassiripour 2001; Supriyadi 1998).

Capital market investors often focus on earnings before interest, tax depreciation and amortisation (EBITDA) as a key performance indicator reflecting the organisation’s operational efficiency (Misund, Osmundsen and Asche 2005). Investors frequently use EBITDA as proxy for cash flows from the core continuing business when forecasting future cash flows to estimate the value of the firm (Berk, Demarzo and Harford 2009; Berk, Demarzo, Hartford, Ford and Finch 2011; Misund et al. 2005). Extant literature has mainly examined and revealed that EBITDA have value relevance information in explaining share market returns (Florou and Chalevas 2010; Misund et al. 2005). However, these studies only indirectly implied that EBITDA have the ability for future operating cash flows prediction. There are limited studies directly substantiating the predictive ability of EBITDA for future operating cash flows and in comparison to other accounting performance measurements within the Malaysian context.

Prior studies examining the comparative predictive abilities of accrual-based accounting and operating cash flows information were mainly conducted in other countries,
predominantly in the United States (such as Barth et al. 2001; Finger 1994; Francis 2008; Penham and Yehuda 2009; Quirin, O’Bryan, Wilcox and Berry 1999; Waldron and Jordan 2010). These findings may not be generalisable to a developing country like Malaysia due to differing industry characteristics, earnings volatility, accounting practices and statutory regimes. There are limited studies directly examining this accounting phenomenon within the Malaysian context. Previous related studies within the Malaysian context have mainly investigated and documented the value relevance of accounting and cash flows information in explaining share market returns (Cheng and Mohamad 2008; Kadri, Ibrahim and Aziz 2009 and 2010; Pirie and Smith 2008; Shukor, Ibrahim, Kaur and Nor 2009). Other related prior studies in Malaysia have investigated and documented that various financial ratios derived from accounting information are relevant in predicting financial distress of listed Malaysian companies (Abdullah, Halim, Ahmad and Rus 2008; Low, Nor and Yatim 2001; Muhamad-Sori, Abdul-Hamid and Nassir 2006; Muhamad-Sori, Abdul-Hamid, Nassir and Abidin-Mohamad 2001; Sulaiman, Ang and Sanda 2001). These studies provided evidence that accounting and cash flows information for Malaysian listed companies are value relevant in explaining equity market valuation. However, these studies do not provide direct empirical evidence confirming their comparative abilities in predicting future operating cash flows, especially for the industrial products manufacturing industry, which is an important contributor to Malaysia’s economy.

Multiple statutory reforms were introduced to improve corporate governance practices, accounting and statutory reporting requirements since the onset of the Asian Financial Crisis in 1997/1998. These reforms are geared toward more transparent financial reporting and strengthening corporate governance practices in Malaysia to improve investor confidence and sustainable growth. Furthermore, Bursa Malaysia (2011c) launched the Capital Market Development Fund-Bursa Malaysia Research Scheme (CBRS) in 2005 to promote the trading volume of firms participating in the scheme by enabling research reports prepared by financial analysts for these firms disseminated freely to all investors via the Bursa Malaysia website. Financial analysts are required to incorporate accounting information analysis, forecast performance and provide
recommendations for these listed firms (Bursa Malaysia 2011c). Since the launch of this research scheme, Bursa Malaysia (2011d) has declared that these research reports have been very successful in directly impacting and generating trading volumes on the firms that participated in the scheme. Consequently, phase two was launched in 2007 and recently, phase three were launched in 2011 (Bursa Malaysia 2011c and 2011d). However, financial analysts in Malaysia perceive that information in the income statement such as earnings, are superior to cash flows in predicting earnings and share values but cash flows are superior to such information when predicting future cash flows (Shukor, Nor and Keliwon 2011). This contradicts the emphasis placed by accounting standard setters (FASB 1978) that information derived from the accrual basis in reporting financial performance is superior to cash flows for forecasting future cash flows due to the inherent timing and matching issues with cash flows reporting and the lack of information comprehensiveness associated with cash accounting reporting basis. Due to these developments, there is an urgent need to provide financial analysts and users of financial statements deeper insights on the extent accounting and operating cash flows information are able to predict future operating cash flows. The findings from this study should enhance the accuracy of the operating cash flow forecasts and recommendations in the research reports prepared by financial analysts and enable capital market investors to make more informed investment decisions.

In summary, the comparative abilities of earnings, operating cash flows and accruals in predicting future operating cash flows are still contradictory and inconclusive. There are limited studies in Malaysia that have provided direct empirical evidence substantiating this accounting phenomenon. This study investigates the comparative abilities of earnings, accruals, EBITDA and operating cash flows information reported by the listed industrial products manufacturing companies for future operating cash flows prediction. This will enrich the understanding on the extent such financial information are able to predict future operating cash flows and enhance the process of making investment decisions. It will also provide empirical evidence on the comparative relevance of accrual accounting versus cash accounting principles in reporting financial information to enable
an improved assessment of the listed firm’s ability in generating future operating cash flows within the Malaysian context.

1.3 Research Problem, Research Questions, Hypotheses and Objectives

This section describes the research problem, research questions, objectives and the hypotheses developed from extant literature to predict the answers to the research questions.

1.3.1 Research problem

This study seeks to extend prior research to address the identified research issues in the current literature within the Malaysian context. The research problem to be addressed is:

“To what extent can historical earnings, accruals, operating cash flows and EBITDA information predict the future operating cash flows of listed Malaysian industrial products manufacturing companies?”

1.3.2 Research questions

The research questions derived from the research problem and research issues are as follows:

Research question 1
Do historical earnings have the significant ability to predict the future operating cash flows of listed Malaysian industrial products manufacturing companies?

Research question 2
Do historical operating cash flows have the significant ability to predict the future operating cash flows of listed Malaysian industrial products manufacturing companies?

Research question 3
Do historical operating cash flows combined with aggregated accruals have the significant ability to predict the future operating cash flows of listed Malaysian industrial products manufacturing companies?
Research questions 4
Do historical operating cash flows combined with disaggregated accrual components have the significant ability to predict the future operating cash flows of listed Malaysian industrial products manufacturing companies?

Research question 5
Do historical EBITDA have the significant ability to predict the future operating cash flows of listed Malaysian industrial products manufacturing companies?

Research question 6
Which of the following: earnings, operating cash flows, operating cash flow combined with aggregated accruals, operating cash flows combined with disaggregated accrual components or EBITDA model has the most superior ability in predicting the future operating cash flows of listed Malaysian industrial products manufacturing companies?

1.3.3 Research hypotheses
Hypotheses, which are developed from extant literature to predict the answers to the research questions, are as follows:

Hypothesis 1 posits that historical earnings have the significant ability to predict the future operating cash flows of listed Malaysian industrial products manufacturing companies. This predicts the answer to research question 1.

Hypothesis 2 posits that historical operating cash flows have the significant ability to predict the future operating cash flows of listed Malaysian industrial products manufacturing companies. This predicts the answer to research question 2.

Hypothesis 3 posits that historical operating cash flows combined with aggregated accruals have the significant ability to predict the future operating cash flows of listed Malaysian industrial products manufacturing companies. This predicts the answer to research question 3.
Hypothesis 4 posits that historical operating cash flows combined with disaggregated accrual components have the significant ability to predict the future operating cash flows of listed Malaysian industrial products manufacturing companies. This predicts the answer to research question 4.

Hypothesis 5 posits that historical EBITDA have the significant ability to predict the future operating cash flows of listed Malaysian industrial products manufacturing companies. This predicts the answer to research question 5.

Hypotheses 6 posits that the ability of operating cash flows combined with disaggregated accrual components model is the most superior compared to earnings, operating cash flows, operating cash flows combined with aggregated accruals and EBITDA models in predicting the future operating cash flows of listed Malaysian industrial products manufacturing companies. This predicts the answer to research question 6.

1.3.4 Research Objectives

The Research Objectives are as follows:

i. Provide empirical evidence that historical earnings, accruals, EBITDA and operating cash flows information have the significant ability to predict the future operating cash flows of listed Malaysian industrial products manufacturing corporations,

ii. Provide empirical evidence on the comparative predictive abilities of earnings, accruals, EBITDA and operating cash flows for the future operating cash flows of listed Malaysian industrial products manufacturing corporations,

iii. Explain the extent earnings, accruals, operating cash flows and EBITDA information are able to predict the future operating cash flows of listed Malaysian industrial products manufacturing corporations and

iv. Narrow the gap in current literature and contribute to the existing body of knowledge.
1.4 Justifications and Contribution of this Research

This section provides the justifications and contributions of this research from investigating the comparative abilities of accrual-based versus cash-based accounting information for future operating cash flows prediction.

Reported accounting information is expected to be relevant and useful in influencing the process of making economic decisions. A primary purpose of the financial statement is to enable users, which are predominantly investors, to evaluate the firm’s ability to generate future cash flows as part of their decision making process (IASB 2001). Securities Commission Malaysia (2011a), which is the statutory body regulating all the listed companies in Malaysia, has also emphasised that financial reporting by listed companies provides essential information to capital market investors in assisting them to make informed investment decisions.

Earnings prepared using the accrual accounting principles is expected to provide better indication of future cash flows than cash flows information prepared under cash accounting due to the matching and timing variability inherent in cash accounting (Dechow 1994; Dechow, Kothari and Watts 1998; FASB 1978). However, earnings have been criticised as can be biased since it is subject to assumptions and estimations by management (Dechow et al. 2008; Obinata 2002), whereas cash flows information is arguably more objective, factual and free from management discretions (Athukorala and Reid 2003; Elliot and Elliot 2007). Despite numerous studies that have investigated this accounting phenomenon (such as Al-Attar and Hussain 2004; Barth et al. 2001; Ebaid 2011; Habib 2010; Waldron and Jordan 2010), research evidence remains contentious on the comparative abilities of earnings, accruals and operating cash flows for future operating cash flows prediction. This study aims to provide further insights on this accounting phenomenon.

Majority of prior studies are conducted in the developed countries, namely the United States, which has larger and more mature industries and economies. The findings from these prior studies may not be readily generalisable to Malaysia due to differences in the
nature and characteristics of Malaysian industries, earnings volatility, business cycles, accounting practices and statutory requirements. Furthermore, accounting practices and disclosures are strongly associated with cultural values and may differ across nations (Perera 1989). Differences in the accounting policies and statutory requirements between countries, specifically code-law regimes and common-law regimes, can also influence the comparative predictive abilities of accrual-based earnings and cash flows for future cash flows (Hollister, Shoaf and Tully 2008). Since the United States practices code law legal regime whereas Malaysia practices the common law legal system, the differences in the statutory regimes between the two nations may result in different implications on the predictive abilities of accounting and cash flows information for future cash flows.

Related prior studies conducted in Malaysia (Cheng and Mohamad 2008; Kadri et al. 2009 and 2010; Pirie and Smith 2008; Shukor et al. 2009) have mainly investigated and documented the value relevance of accounting and cash flows information (such as earnings, cash flows, intangible assets, earnings per share and equity book value) in explaining share market returns. For example, earnings are reported as more value relevant compared to operating cash flows when estimating market value while operating cash flows is only useful in the short term (less than 51 days) when used jointly with earnings information (Cheng and Mohamad 2008). Shukor et al. (2009) have reported that intangible non-current assets have negative associations with share prices during varying economic and accounting conditions while Kadri et al. (2009) have documented that the strengthening of accounting reporting standards under the newly introduced FRS regime in Malaysia enhanced significantly the value relevance of book value but not earnings. Disaggregated book value and earnings were also documented as superior in explaining variations in share value than aggregated book value and earnings for listed Malaysian high-tech companies (Kadri et al. 2010). Other related studies in Malaysia (such as Abdullah et al. 2008; Low et al. 2001; Muhamad-Sori et al. 2006; Muhamad-Sori et al. 2001) have examined the ability of financial accounting ratios in predicting financial distress of listed Malaysian companies and documented that the financial ratios relevant in predicting financial distress are mainly those relating to profitability, cash flows, asset utilisation and debt level. However, there are limited studies in Malaysia that
provided direct empirical evidence substantiating the comparative abilities of accrual-based and cash-based accounting information for future operating cash flows prediction.

Furthermore, there are limitations in using share prices in such prediction studies as the capital market maybe inefficient in processing information, resulting in the share prices diverging from the fundamentals (Dechow 1994) and not fully reflecting changes in the firm’s value (Arthur and Chuang 2006; Ebaid 2011; Yoder 2006). Prior research has reported that the share prices do not fully differentiate the information content between accruals and cash flows information (Sloan 1996; Yang 2000). Additionally, emerging capital markets, such as Malaysia, have dissimilar characteristics compared to the more mature capital market in the developed countries. Emerging capital markets have less mature investors, less efficient information processing, lower number of listed companies and fewer regulations/disclosure requirements (Ebaid 2011). Empirical studies in other developed countries have also reported that the association between share market returns and earnings are declining (Brown, Lo and Lys 1999; Collins, Maydew and Weiss 1997; Ely and Waymire 1999; Francis and Schipper 1999; Jones 2003; Lev and Zarowin 1999). When evaluating the comparative predictive abilities of accrual-based accounting and operating cash flows information, the anomalies in the data arising from other factors can be minimised if operating cash flows are used as proxy for future operating cash flows instead of market returns (Arthur and Chuang 2006; Waldron and Jordan 2010; Yoder 2006). Operating cash flows have less inherent problems or distortions compared to prediction studies using share market returns. This study seeks to contribute to current literature with more reliable and direct empirical evidence by using reported operating cash flows as proxy for future operating cash flows.

As part of improving the trading activities of Malaysian listed company shares, Bursa Malaysia (2011c) launched the CBRS scheme in 2005 to enable research reports prepared by the brokerage securities houses to be quickly and freely disseminated via the internet. Bursa Malaysia (2011c) has made it compulsory for these research reports, which are prepared by the financial analysts employed by the licensed securities brokerage firms, to incorporate accounting information when forecasting the firms’ performance, such as
forecasts on cash flows, earnings and share value. Such research reports prepared by financial analysts can influence investment activities, as evidenced by extant literature that analysts’ forecasts are relevant for making economic decisions (Brown 1993; Clement and Tse 2003; Coen, Desfleur and L’Her 2009; Mozes 2003). Bursa Malaysia (2011g) reported that the trading volume of the listed companies, in which research reports were prepared and made publicly available to all investors, have increased by nearly 56% over a one year period since the initial launch in 2005. Due to the success of this scheme in generating investment activities of the participating listed firms, Bursa Malaysia launched phase two in 2007 (Bursa Malaysia 2011c) and phase three recently in 2011 (Bursa Malaysia 2011d). Consequently an increasing number of research reports prepared by financial analysts are expected to be disseminated freely to all investors. This can influence the investment decision making of investors and cause further increases in trading activities of participating companies in the scheme.

A recent study has reported that financial analysts in Malaysia perceive that information in the income statement, such as earnings, are superior to cash flows information when forecasting earnings and share values but cash flows information are more relevant when forecasting future cash flows (Shukor et al. 2011). This study revealed that financial analysts in Malaysia emphasised more prominence on the ability of past operating cash flows compared to accrual-based earnings information in predicting future operating cash flows. This perception contradicted the emphasis by accounting standard setters that accrual-based earnings information prepared using the accrual accounting principles is superior to cash flows information in predicting future cash flows as cash flows suffer from timing and matching issues and provide less comprehensive information (FASB 1978).

Due to the recent developments in Bursa Malaysia, the increasing issuance of numerous research reports prepared by financial analysts via the internet and the conflicting perceptions between financial analysts and accounting standard setters, there is an urgent need to examine the comparative abilities of accrual-based and cash-based accounting measures for future cash flows prediction and explain the extent to which accounting and
operating cash flows information are able to predict future operating cash flows. The findings can assist financial analysts to improving the accuracy of their cash flow forecasts and resolve the current conflicting perspectives between financial analysts and accounting standard setters.

Accounting information that is disclosed due to enforcement regulations are more useful for decision making purposes than those that have less regulations (Hassan and Power 2009; Hodgson, Tongkar, Harless and Adhikari 2008). The strengthening of corporate governance and accounting reporting regulations since the Asian financial crisis of 1997/1998 through a series of reforms in Malaysia (such as the establishment of the Code of Corporate Governance, Malaysian Accounting Standards Board formation and the convergence to International Accounting Standards reporting) should result in more accurate, standardised and reliable accounting information compared to pre-crisis. Another motivation for this study is to investigate the extent to which past accounting and cash flows information are able to explain future cash flows following the reforms undertaken by the Malaysian government after the Asian financial crisis.

Prior studies have mainly pooled accounting information across diverse industries with different industry characteristics (such as Al-Attar and Hussain 2001 and 2004; Chotkunakitti 2005; Ebaid 2011; Habib 2010; Hollister et al. 2008). Research evidence has revealed that diverse industries with varying characteristics and different earnings volatility due to different operating cycles and firm sizes have different degree of influence on future cash flows prediction (Dechow and Dichev 2002; McNichols 2002; Palepu, Healy and Bernard 2000). Consequently pooling a cross section of companies may result in biased findings. This study is different from previous research by focusing only on listed companies classified by Bursa Malaysia within the industrial products manufacturing sector. These are firms that produce new products for industrial usage from materials or components (Bursa Malaysia 2011f). By focusing only on a single industry instead of a cross section of multiple industries, this approach limits the impact of widely diverse industry characteristics on the findings and enhances the reliability of this study compared to prior studies. Furthermore, the manufacturing sector is an
important aspect of the Malaysian economy since it contributes about a quarter (RM817.7 billion in 2008) of Malaysia’s Gross Domestic Product and is one of the fastest growing sectors with an average growth rate of 10.1% per annum (Department of Statistics Malaysia 2011). Within the manufacturing sector, the industrial products manufacturing sector is an important sector as it contributes more than one third of the total manufacturing sector output in Malaysia (Department of Statistics Malaysia 2011). These are mainly contributed by the manufacture of refined petroleum products, electronic valves, tubes and basic chemicals (Department of Statistics Malaysia 2011).

Although there are many users of financial information, investors are deemed the primary user since they are the risk capital providers and generally information relevant for them should also be sufficient to other users (IASB 2001, paragraph 10). This study aims to provide capital market investors and analysts a deeper comprehension on the extent published accounting information, which are prepared according to the MASB issued accounting standards, can be used for future operating cash flows prediction within the Malaysian context. The findings from this study should enable a better evaluation of the company’s financial performance by capital market investors and analysts in Malaysia, thereby assist in managing and valuing their capital market investments. It also seeks to confirm or refute the perceptions of analysts and standard setters on the comparative abilities of earnings, accruals and operating cash flows for future operating cash flows prediction. Furthermore, this research seeks to provide empirical evidence on the ability of EBITDA for future operating cash flows prediction, which are often emphasised by analysts as an important performance indicator and often used as a proxy for operating cash flows when forecasting future operating cash flows (Berk et al. 2009; Berk et al. 2011; Misund et al. 2005)

Prior studies were mainly conducted in other countries, predominantly in the United States, which has more efficient capital market and larger economies. This research differs from prior studies by examining this accounting phenomenon in the context of a developing nation (Malaysia) that has an emerging capital market and has undergone various corporate governance and accounting reporting reforms. Moreover, previous
studies conducted in Malaysia have mainly examined and documented the value relevance of accounting information in association with share market returns or relevance in predicting corporate distress. This research is different from prior studies in Malaysia as it aims to provide empirical evidence directly confirming the extent to which accrual-based accounting and operating cash flows information are able to predict future operating cash flows by focusing only on listed Malaysian industrial products manufacturing firms instead of pooling financial information from a cross section of multiple industries that can cause biasness in the findings. The actual operating cash flows are used as proxy for future operating cash flows instead of share prices.

Furthermore, this research will provide deep insights on the relative usefulness of the accrual-based and cash-based accounting measures and assist analysts, investors, regulators, and other stakeholders when evaluating the financial performance and the liquidity of listed Malaysian companies. This can lead to better resource economic allocation by enabling investors to make better informed investment decisions, thereby promoting a more efficient Malaysian capital market.

1.5 Research Design
The previous section examined the motivations and justifications for conducting this research. This section provides briefly an overview of the research design employed.

Explanatory research builds on existing research to explain an observed phenomenon, substantiate or discard explanations or predictions, extend or test theory (Neuman 2006). This study seeks to extend prior studies by investigating the comparative abilities of accounting and operating cash flows information for future operating cash flows prediction of listed Malaysian industrial products manufacturing companies. This is an explanatory research as the primary aim is to explain the causal-relationship between historical accounting and operating cash flows information with future operating cash flows by extending past research conducted in other countries within the Malaysian context.
The approach guiding this research is within the positivism paradigm. As this is an explanatory research, the positivist approach adopted is most suitable since positivist researchers seek to examine cause-effect relationship developed from theory to explain an observed phenomenon using quantitative methods (Healy and Perry 2000; Neuman 2006). Ordinary least squares method is utilised to develop fifteen multiple linear regression models as proxies for prediction models, to predict up to three years ahead future operating cash flows. Statistical techniques are used to analyse the regression results and test the hypotheses to provide answers to the research questions. Sample data are collected for a period of 11 years from 1999 to 2009 from the published annual financial statements of 97 listed Malaysian industrial products manufacturing corporations with a 31st December year end. The conclusions and implications are drawn and discussed in the context of relevant literature. Figure 1.2 illustrates the research design overview.

Figure 1.2  Research design overview

Source: Developed for this study.
1.6 Model Building

Univariate and multiple linear regression models, as proxies for future operating cash flows prediction models, are developed to test the hypotheses using the ordinary least squares method. The approach adopted is consistent with prior studies (such as Al-Altar and Hussain 2004; Barth et al. 2001; Chotkunakitti 2005; Ebaid 2011; Habib 2010).

The generic regression model takes the form of:

\[ Y_t = a_0 + a_1 X_{t-1} + a_2 X_{t-2} + \ldots + a_i X_{t-i} + \epsilon \]

Where \( Y_t \) is the outcome or predicted variable for the current year \( t \)

\( X_{t-i} \) is the predictor variables,

\( i \) is the number of years lagged from year \( t \), which is one, two, or three years,

\( a_i \) is the regression coefficient associated with the predictor variable,

\( a_0 \) is the value of the outcome when the predictor is zero and

\( \epsilon \) captures omitted factors (the error terms).

The dependent variable is the net cash flow from operations in the current year \( t \), as proxy for future operating cash flows. The predictors or independent variables are measured as past one, two and three years of earnings after tax but before extraordinary items and discontinued operations, net cash flow from operations, aggregated accruals (computed as the difference between earnings and operating cash flows), disaggregated accrual components (accounts receivable changes, accounts payable changes, inventory changes, depreciation and amortisation and other accruals changes) and earnings before interest, tax, depreciation and amortisation (EBITDA). All the variables are scaled by the average total assets to eliminate size and reduce heteroskedasticity problems, which is consistent with prior studies (such as Anderson, Woodhouse, Ramsay and Faff 2007; Barth et al. 2001; Collins and Hribar 2002; Ebaid 2011; Hollister et al. 2008; Sloan 1996; Yoder 2006).

Regression models, as proxies for the prediction models, are developed to test each of the hypotheses one to five. These models comprised of (i) one year-lag predictor, (ii) one year-lag and two years-lag predictors and (iii) one year-lag, two years-lag and three
years-lag predictors. The dependent variable is the current net operating cash flows as proxy for future operating cash flows and systematically regressed on accrual-based accounting and operating cash flows information as predictors. The prediction models developed to test each hypothesis are the earnings model (relating to hypothesis one), the operating cash flows model (relating to hypothesis two), the operating cash flows combined with aggregated accruals model (relating to hypothesis three), the operating cash flows combined with disaggregated accrual components model (relating to hypothesis four) and the EBITDA model (relating to hypothesis five). There are a total of fifteen prediction models.

The three earnings models, which are developed to test hypothesis 1, comprised of the dependent variable, which are net operating cash flows in the current year t as proxy for future operating cash flows, regressed systematically on past (i) one, (ii) one and two and (iii) one, two and three years of earnings as predictors. Similarly, the three operating cash flow models comprised of the net operating cash flows in the current year t (as the dependent variable) regressed on past one to three years of net operating cash flows as predictors. The three operating cash flows combined with aggregated accruals models comprised of the operating cash flows in the current year t regressed on past one to three years of net operating cash flows and aggregated accruals as predictors. For the three operating cash flows combined with disaggregated accrual components models, the predictors are past one to three years of net operating cash flows and disaggregated accrual components, which are accounts receivable changes, accounts payable changes, inventory changes, depreciation and amortisation and other accruals changes. Lastly, for the three EBITDA models, the predictors are past one to three years of EBITDA.

Figure 1.3 illustrates the prediction models developed and matched to test each hypothesis and provide answers to the research questions. Three regression models as proxies for the prediction models, comprising of past one, two and three years of past financial information, are developed to test each hypothesis.
1.7 Data Collection and Analysis

The accounting data are collected from secondary sources, which are published annual financial reports of public listed companies classified within the Industrial Products Manufacturing Sector by Bursa Malaysia. The use of secondary data is acceptable for explanatory research (Saunders, Lewis and Thornhill 2003; Neuman 2006) and this approach is consistent with prior studies (such as Barth et al. 2001; Chotkunakitti 2005; Ebaid 2011; Farshadfar et al. 2008; Habib 2010; Hollister et al. 2008). It is also commonly used in testing accounting or finance theories (Chotkunakitti 2005). The research period is for 11 years from 1999 to 2009. Only listed companies with 31st December financial year-end and at least seven consecutive years of financial statements to enable adequate data for the analyses are selected. From a total population of 263 listed companies within this category, 97 companies (37%) meet all the required criteria and were selected for the study.

The sample is partitioned into two sub-samples; the within sample (1999 to 2008), which is used to develop the prediction models and hypotheses testing and the holdout sample (2009), which is used to evaluate the predictive ability and validity of the prediction
models developed from the within sample. In arranging the data, the accounting data were pooled such that each firm with a corresponding one year of accounting data represents a firm-year and each firm-year represents a case. The total number of firm-years or cases was 918 from pooling the accounting data of the selected 97 firms. This approach is consistent with Chotkunakitti (2005), Stammerjohan and Nassiripour (2001) and Supriyadi (1998). Additional to the holdout sample, the models are also cross validated by comparing the adjusted $R^2$ derived from SPSS with an alternative adjusted $R^2$ computed using Stein’s formula, as recommended by Field (2009) and Stevens (2002).

The statistical tests conducted are the F-statistics, t-statistics, Pearson’s correlation coefficient, Durbin-Watson statistics and the level of significance arising from the regressions. The comparative predictive abilities of the models are evaluated using the adjusted $R^2$. The Durbin-Watson statistics were used to detect for the existence of serial correlations and ensure that the residuals are independent and uncorrelated. Histograms are constructed from the residuals derived from the regression models and visually inspected against the normal distribution curve for normality. Scatter-plot graphs are developed from plotting the standardised residuals against the standardised predicted values for each model and visually examined to ensure that the homoscedasticity and linearity assumptions are adhered, as recommended by Field (2009). Statistical analysis is conducted using the Statistical Processing for Social Scientists (SPSS) version 16.0 software.

1.8 Outline of the Thesis
This thesis has five chapters. The first chapter introduced the research background, the research problem and issues, research design and justifications for the research. The second chapter examines the relevant extant literature to chart the body of knowledge relating to the research area, identify research issues in current literature and the research problem. This involves reviewing the development and overview of Bursa Malaysia, Malaysian financial reporting regulations, the principles of accruals and cash accounting (parent disciplines), prior research on accounting information in predicting future operating cash flows (immediate discipline) and other studies related to the research area.
The third chapter examines the paradigm guiding this research and the methodology for data collection and analysis. The fourth chapter describes the data collection, preparation and analysis of the hypothesis testing. The fifth chapter provides the conclusions and implications of the findings from chapter four in the context of relevant literature examined in chapter two.

1.9 Definitions

The abbreviations used for this research are described and listed in alphabetical order in table 1.1.

Table 1.1 Abbreviations and the associated descriptions

<table>
<thead>
<tr>
<th>Abbreviations</th>
<th>Descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACR</td>
<td>Refers to aggregated accruals. Earnings can be disaggregated into operating cash flows and accruals (Cheng and Hollie 2008; Chotunakitti 2005; Dechow 1994). Aggregated accruals are computed as the difference between earnings and operating cash flows. This can be further disaggregated into accrual components, which are accounts receivable changes, accounts payable changes, inventory changes, other accruals changes and depreciation and amortisation expenses.</td>
</tr>
<tr>
<td>AP</td>
<td>Refers to changes in accounts payable, which is the difference between accounts payable at the end of the period and the beginning of the period.</td>
</tr>
<tr>
<td>AR</td>
<td>Refers to changes in accounts receivable, which is the difference between accounts receivable at the end of the period and the beginning of the period.</td>
</tr>
<tr>
<td>CFO</td>
<td>Refers to net cash flow arising from operations, which is the difference between cash receipts and cash payments relating to the operating activities of the company.</td>
</tr>
<tr>
<td>DEPRM</td>
<td>Refers to depreciation and amortisation expenses.</td>
</tr>
<tr>
<td>EARN</td>
<td>Refers to earnings after tax but before extraordinary items and discontinued operation.</td>
</tr>
<tr>
<td>EBITDA</td>
<td>Refer to earnings before interest, tax, depreciation and amortisation, extraordinary items and discontinued operation.</td>
</tr>
<tr>
<td>FASB</td>
<td>Financial Accounting Standard Board, United States.</td>
</tr>
<tr>
<td>IASB</td>
<td>International Accounting Standard Board.</td>
</tr>
<tr>
<td>INV</td>
<td>Refers to inventory changes, which is the difference between inventory at the end of the period and the beginning of the period.</td>
</tr>
<tr>
<td>MASB</td>
<td>Malaysian Accounting Standard Board</td>
</tr>
<tr>
<td>OTH</td>
<td>Refers to other accruals changes arising from other current assets and current liabilities changes.</td>
</tr>
</tbody>
</table>

Source: Developed for this study.
1.10 Delimitations of Scope

This section examines the delimitations of scope for this study, which may affect this research’s generalisability and validity.

This study investigates and focuses only on the industrial products manufacturing sector. The findings may not be generalisable to other industries. This approach is appropriate since empirical research has shown that diverse industries with different earnings volatility and characteristics have different implications for future cash flows prediction (Dechow and Dichev 2002; McNichols 2002; Palepu et al. 2000). By focusing only on one industry, it minimises inferences from different industry dynamics and characteristics, thereby enhancing the reliability of the findings.

The samples for this study are companies listed on Bursa Malaysia categorised within the industrial products manufacturing sector. The findings from this research may not be easily generalisable to unlisted private limited companies. This approach is acceptable as the Malaysian capital market is substantially valued at RM1,275 billion (USD425 billion) in 2010 (Bursa Malaysia 2011e) and the findings from this study should assist capital market investors and financial analysts to make more accurate future operating cash flows forecasts based on financial information. This will assist investors to make better informed investment decisions.

This study utilises only secondary sources of accounting data, derived from annual statements. The accounting data is historical in nature and may not be generalisable to the future. This study seeks to enhance the validity of the research by covering a long period, 11 years from 1999 to 2009, during which the economy is stable. The research period covered minimised inferences from the Asian financial crisis, which occurred during 1997 and 1998 and from the significant changes in the Malaysian financial reporting environment between 1997 and mid-1999 when the Malaysian Accounting Standards Board was set up and new accounting standards were introduced. Additionally, a holdout sample and other validation tests are used to examine the validity and robustness of the prediction models.
1.11 Conclusion

This chapter provided an overview of the research background, the research problem, research issues, hypotheses and objectives. It also outlined the research design and the methodology for the data collection and analysis. The justifications, contributions and delimitations of scope for this research were also discussed.

The next chapter examines the extant literature relevant to the research area.
CHAPTER 2

Literature Review

2.1 Introduction
This chapter reviews the extant literature associated with the research topic. The background and developments of Bursa Malaysia, which is the stock exchange in Malaysia and the Malaysian financial reporting regimes are examined to provide an overview of the regulatory reporting environment. The importance of forecasting future cash flows is also highlighted. The two parent disciplines reviewed are accrual and cash accounting principles and the immediate discipline examined is research on the comparative abilities of past accrual-based accounting and operating cash flows information in predicting future operating cash flows. Prior studies related to the main research area are also reviewed. These are mainly capital market studies comparing the value relevance of accounting and cash flows information in explaining equity market returns and other related studies on accounting information relevance within the Malaysian context.

This chapter is divided into nine sections. The overview and introduction of this chapter is provided in section 2.1. The background and development of the Bursa Malaysia and the Malaysian financial reporting regulations are examined in section 2.2. Key highlights are the establishment of the Companies Act, the Financial Reporting Act, the Malaysian Accounting Standards Board (MASB) and the development of accounting standards. The strengthening of corporate governance and regulatory regime as a consequence of the Asian Financial Crisis in 1997 and 1998 are also examined in this section. The purposes and importance of forecasting future cash flows from accounting information are examined in section 2.3. The two parent disciplines relating to the research topic, which are accrual accounting and cash accounting principles, are discussed in section 2.4. The strength and shortcomings of these two key accounting principles are critically compared and contrasted in this section. Section 2.5 examines prior studies on the comparative abilities of earnings, accruals and operating cash flows information in predicting future
operating cash flows as the immediate discipline. There are two main research themes of comparative studies identified and reviewed in this section. The first main research theme compared earnings and operating cash flows as predictors of future operating cash flows. The second major research theme investigated the incremental explanatory ability of aggregated/disaggregated accruals when combined with operating cash flows compared to earnings-only and operating cash flows-only as a single predictor of future operating cash flows.

Other prior studies relating to the research area are reviewed in section 2.6 to provide a better comprehension of the accounting phenomenon being studied. These are mainly prior studies on the comparative abilities of earnings, accruals and cash flows information in explaining share market returns. Other related studies are research that have investigated the value relevance of accounting information in explaining share market returns and the ability of financial ratios derived from accounting information as predictors of financial distress for listed corporations in Malaysia. These related studies are also examined in this section.

Section 2.7 discusses on the research issues and gaps identified from reviewing the existing body of knowledge. Section 2.8 develops the research problem, questions and hypotheses. Section 2.9 concludes the chapter.

Chapter 2 structure is illustrated in figure 2.1.
Figure 2.1  Chapter 2 Structure: Literature Review

- 2.1 Introduction
- 2.2 Background and Development of Bursa Malaysia and Financial Reporting Regulations in Malaysia
- 2.3 Importance of Future Cash Flows Prediction
- 2.4 Parent Disciplines: Accrual and Cash Accounting
- 2.5 Immediate Discipline
- 2.6 Other Related Studies
- 2.7 Research Issues and Gaps
- 2.8 Research Problem, Research Questions and Hypotheses
- 2.9 Conclusion

Source: Developed for this study.
2.2 Background and Development of Bursa Malaysia and Financial Reporting Regulations in Malaysia

The background and development of Bursa Malaysia and the financial reporting regulations in Malaysia are examined in this section. The historical background of Bursa Malaysia, highlights on the capital market growth in the last two decades and recent developments are evaluated in section 2.2.1. The financial reporting regulations and development in Malaysia are examined in section 2.2.2.

2.2.1 Bursa Malaysia background and developments

The Singapore Stockbrokers’ Association, which was founded in 1930, was the first formal securities business in Malaysia (Bursa Malaysia 2011b; Low 2000). It was re-registered in 1937 as the Malaysian Sharebrokers’ Association but there was no public share trading until 1960, when the Malayan Stock Exchange was established and the first public participation in share trading occurred in the trading rooms of Malaysia and Singapore linked by telephone lines (Bursa Malaysia 2011b; Low 2000). The cessation of Singapore from Malaysia occurred in the year 1965, which is an important event in the history of Malaysia, resulting in the Malayan Stock Exchange renamed as the Stock Exchange of Malaysia and Singapore (Bursa Malaysia 2011b; Low 2000).

In 1973, two prominent events occurred in the development of Malaysia’s financial market. The first was the Stock Exchange of Malaysia and Singapore separated into the Kuala Lumpur Stock Exchange Berhad and the Stock Exchange of Singapore due to the termination of the currency inter-changeability between Malaysia and Singapore and catering to the rapid rise in the large and diversified numerous listed Malaysian companies on the stock exchange (Bursa Malaysia 2011b; Low 2000). The second event was the Securities Industry Act 1973 formation to regulate the securities market and empower the Government to minimise market speculations, insider trading, share or market manipulations (Low 2000). The purpose was to protect investors’ interests and encourage long term sustainability of the Malaysian capital market. The Kuala Lumpur Stock Exchange (KLSE), which was incorporated as a new company limited by guarantee, took over the Kuala Lumpur Stock Exchange Berhad’s operations in 1976.
During 1983, a new Securities Industry Act was introduced and this replaced the Securities Industry Act 1973 (Low 2000).

Since 1993, the regulation of the capital market falls mainly to four bodies, namely the Securities Commission Malaysia (SC), Bank Negara Malaysia, the Foreign Investment Committee and the Registrar of Companies (Low 2000). Of the four main bodies, the SC is tasked with the pivotal role to advance and expand the securities and futures market and responsible for regulation and monitoring of securities market transactions. This includes the supervision of exchanges, clearing houses and central depositories, registration authority for company prospectuses and approval authority for bond issuance by companies (Securities Commission Malaysia 2011b). They are also responsible for promoting and monitoring the compliance to regulations by the market institutions and licensed persons and the issuance of financial instruments (Securities Commission Malaysia 2011b).

The types of securities traded on Bursa Malaysia are ordinary and preference shares, fixed income securities (such as debentures and bonds), share warrants and close-end trusts (Bursa Malaysia 2011a). The futures and options contracts are traded via their subsidiary company, Bursa Malaysian Derivative Berhad (which is jointly owned with Chicago Mercantile Exchange), with predominant trading on crude palm oil futures.

Despite the advent and impact of the Asian Financial Crisis in 1997 to 1998, the number of companies listed on Bursa Malaysia grew from 285 in 1990 (Low 2000, p.75) to nearly 1000 in 2010 (Bursa Malaysia 2011a). Furthermore, market capitalisation has increased by nearly 866% (averaging 43% per year) in the last two decades from RM132 billion (USD49 billion) in 1990 (Low 2000, p.44) to RM1,275 billion (USD425 billion) in 2010 (Bursa Malaysia 2011e).

Recent developments of Bursa Malaysia

KLSE changed the name to Bursa Malaysia when the stock exchange was demutualised in 2004 (Bursa Malaysia 2011b). The main objectives of the demutualisation exercise
were to promote the stock exchange’s competitive position and adapt quickly to global trends in the stock exchange sector by becoming more customer and market focused (Bursa Malaysia 2011b). Nearly a year later, Bursa Malaysia was listed on the Main Board in 2005.

During the same year, Bursa Malaysia launched the Capital Market Development Fund-Bursa Malaysia Research Scheme (CBRS) whereby listed companies participating in this scheme will allow the research reports about their company, which are prepared independently by financial analysts employed by the securities brokerage houses, freely accessible to all investors via the website of Bursa Malaysia (Bursa Malaysia 2011c). The objective of this scheme is to disseminate important information timely via the internet to assist investors in making better informed investment decisions. The preparation of these research reports required financial analysts to examine and forecast the financial performance of the listed companies using the reported accounting and other relevant information (Bursa Malaysia 2011c). Empirical studies have documented that research reports and forecasts prepared by analysts are able to influence investment activities (Brown 1993; Clement and Tse 2003; Coen et al. 2009; Mozes 2003). Since the launch of the CBRS program in 2005, Bursa Malaysia (2011d) has declared that these research reports have direct impact in increasing the trading volume of those listed companies that participated in the scheme. Due to the success of this scheme in encouraging more investment activities in the participating firms, phase two of the CBRS scheme was launched in 2007 and recently, phase three was launched in 2011 (Bursa Malaysia 2011b and 2011c). An increasing number of research reports on the Malaysian listed companies comprising of forecasts and recommendations prepared by financial analysts from reported accounting, cash flows and other relevant information are expected to be disseminated quickly and made freely available to all investors through the internet. This is expected to influence the trading and investment activities on these listed companies’ shares in which the research reports are prepared.

Financial analysts conduct forecasts on the company’s financial performance such as earnings, cash flows and shares prices (Ramnath, Rock and Shane 2008). However,
financial analysts employed by the licensed securities brokerage companies in Malaysia perceive that accrual-based accounting information derived from the income statement, such as earnings, are superior compared to cash flows when forecasting earnings and share prices but cash flows are more relevant than these accrual-based accounting information when predicting future cash flows (Shukor et al. 2011). This suggests that financial analysts in Malaysia placed more prominence on operating cash flows information than accrual-based earnings when forecasting future operating cash flows, which may influence the outcomes and recommendations in the reports prepared by these financial analysts. Such perceptions conflicted with the emphasis by accounting standard setters (FASB 1978) that information derived from accrual accounting is superior to information derived from cash accounting basis in forecasting cash flows. There is an urgent need to address this issue considering that the research reports consisting of forecasts and recommendations prepared by financial analysts can influence investment decisions by investors (Clement and Tse 2003; Coen et al. 2009; Mozes 2003).

2.2.2 Malaysian financial reporting regulations background and developments
The background and recent developments of Bursa Malaysia was discussed in the previous section 2.2.1. This section provides a historical background and overview of the financial reporting regulation developments in Malaysia. The key areas described are the formation and subsequent amendment of the Companies Act 1965, the establishment of the Financial Reporting Act 1997 that resulted in the formation of the Malaysian Accounting Standards Board (MASB), the corporate governance reforms as a consequence of the Asian financial crisis in 1997 and 1998 and the accounting standards development by the MASB.

The early advances in Malaysia’s financial reporting requirements and practices were mainly adopted from the United Kingdom and prominence were placed on the Companies Act, which was established in 1965, to regulate financial reporting requirements and govern the formation, constitutional structure and dissolution of companies in Malaysia (Iskandar, Yang, Salleh and Gregson 2003; Saleh, Iskandar and Rahmat 2005; Tan 2000).
The Malaysian Association of Certified Public Accountants (MACPA), which later joined the International Accounting Standards Committee (IASC), was formed in 1972 to introduce the accounting standards in Malaysia (Ali 2004). MACPA, which subsequently changed their name to the Malaysian Institute of Certified Public Accountants (MICPA), adopted some of the International Accounting Standards (IAS) in 1978 (Ali 2004).

**Amendments to Companies Act 1965.**

The Companies Act 1965 was significantly revised in 1985 with the objective to improve investor protection and attract foreign investors (Ali 2004; Helinna and Wishart 1989). The Companies Act 1965 was amended to incorporate the perceived best accounting standards and practices to introduce more disclosure requirements and more governance policies regarding auditors and their responsibilities. Key minimum requirements introduced in the Companies Act 1965 were the requirement to prepare audited financial statements, which included the profit and loss account statements, balance sheet, statement of changes in financial positions and supporting notes to the financial statements by listed companies (Saleh et al. 2005). The Malaysian Institute of Accountants (MIA), which was initially formed as a statutory body in 1967 to promote and govern the Malaysian accounting profession, remained largely inactive until 1985 when the Companies Act 1965 was revised and the key role of MIA in regulating the accounting profession was reactivated (Ali 2004). Nevertheless, the statutes made no references on which accounting standards to adopt when preparing the financial statements (Saleh et al. 2005).

**Financial Reporting Act 1997 establishment**

The establishment of the Financial Reporting Act occurred in early part of 1997, which provides the rules governing financial reporting in Malaysia and the formation of an independent statutory body, the Malaysian Accounting Standards Board (MASB). The primary responsibility of the MASB is to develop, issue and review existing accounting reporting standards in Malaysia (Financial Reporting Act 1997). Companies in Malaysia are required by the Financial Reporting Act 1997 to comply with the MASB approved accounting standards. This legal requirement was affirmed by the Companies Act 1965,
which required companies to prepare the financial statements in compliance with the applicable approved accounting standards in Malaysia. Although MASB is primarily responsible for the accounting standards to be adopted in Malaysia, they do not have the authority to regulate the practices by companies. The Securities Commission Malaysia and Bank Negara Malaysia hold this authority. The Financial Reporting Foundation (FRF), which was also established under the Financial Reporting Act 1997, governed the MASB. The primary responsibilities of the FRF are to oversee the financing of the MASB operations, evaluate MASB performance and review on the matters in which MASB seeks to implement or adopt (Financial Reporting Act 1997).

The establishment of the Financial Reporting Act 1997 and MASB was formed to address the issue of legally enforceable standardised reporting disclosures and practices by Malaysian companies, which was lacking in the initial statutory reforms of the Companies Act 1965 in 1985. These statutory reforms promote good corporate governance by enhancing corporate financial disclosures, more transparent practices and management accountabilities. However, these reforms merely established the foundation for the creation of a more standardised and statutory required reporting framework and the transformations and enhancements of Malaysia’s financial reporting landscape require time for implementation. As these statutory regulatory reforms were only introduced in early 1997, it was not timely enough to prevent the onslaught of the Asian Financial Crisis in 1997 to 1998, which is discussed in the next section.

**Asian financial crisis 1997-1998**

The establishment of the Financial Reporting Act 1997, the formation of MASB and SC in early 1997 just preceded the onset of the Asian Financial Crisis, which started with the Thai Baht devaluation in July 1997. Malaysia and the rest of the East Asian countries suffered severe economic turmoil during the crisis mainly caused by excessive leverage and poor corporate governance practices from earlier years. The Malaysian economy declined by about 7.5% in 1998 and the value of the Malaysian ringgit depreciated by about 40% against the major currencies while interest rates exceeded 12% (Low 2000, p.7). Investor confidence plunged and the capital market was severely negatively affected.
as market capitalisation contracted by about 70% in 1997 (Low 2000, p.44). Nevertheless, the Malaysian economy subsequently recovered in 1999, which was reflected by the market capitalisation growth by nearly 47% from RM376 billion in 1997 to RM553 billion (USD 145 billion) in 1999 (Low 2000, p.44).

A key factor that contributed to the Asian Financial Crisis was the liberalisation of the financial markets occurring in south-east Asia without concurrent adequate regulation and supervision improvements (Sloman 2003). This resulted in the lack of monitoring and controlling of excessive growth in risky borrowings by companies (Sloman 2003). This factor was compounded by the lack of corporate governance and high ownership concentration structures of Malaysian companies (Mohamad and Muhamad-Sori 2011a).

Good corporate governance encourages fair, open and transparent practices when managers execute their responsibilities to stakeholders (Mohamad and Muhamad-Sori 2011b). It encompasses appropriate checks and balances embedded in the company’s processes in relation to performance management, decision making and monitoring systems (Low 2000). The provision of timely, relevant and easily comprehensible and accessible information is a central theme of good corporate governance (Low 2000). Unfortunately Malaysian companies prior to 1997 largely ignored these good corporate governance practices. The weak corporate governance practices enabled companies to take on excessive risk and leverage heavily, some with implicit guarantees from the state (Low 2000). There were limited transparent, reporting disclosures and accountability practices leading to the financial crisis and investors focused mainly on making short term gains from the robust financial markets (Low 2000). The financial crisis resulted in numerous companies seeking court protection against default claims by their lenders.

The Asian financial crisis, the high profile corporate failures in the United States (such as Enron and WorldCom) and the erosion in the quality of accounting numbers from poor corporate governance prompted the Malaysian government focusing to strengthen corporate governance practices with the objective to promote investor confidence, enhance stability and sustainable foreign investments (Mohamad and Muhamad-Sori...
Key reforms implemented included formation of the high level Finance Committee on Corporate Governance in 1998, which is tasked with developing a code of corporate governance for Malaysia. The Malaysian Code on Corporate Governance (Code) was drafted in March 1999 by the Finance Committee and approved by the Ministry of Finance in 2000 (Saleh et al. 2005). It was enforced on the listed companies in January 2001 by Bursa Malaysia, the Malaysian stock exchange (Saleh et al. 2005). The Code sets out the principles and best practices of corporate governance with focus on four main areas, namely the board of directors’ composition and responsibilities, directors’ remuneration, relationship with shareholders and audit (Malaysian Code on Corporate Governance 2000 and 2007). Bursa Malaysia listing requirements were also revised to require more quality disclosures, timely and relevant information to assist investors in monitoring performance and making better informed economic decision. The Code was subsequently amended in 2007 to strengthen the quality of the board of directors and the audit committee in discharging their roles and responsibilities by adhering to set appointment criteria and guidelines when executing their duties (Malaysian Code on Corporate Governance 2007). Additionally, the amendment also included mandating internal audit functions for all listed companies and clarifying the reporting for the internal auditors (Malaysian Code on Corporate Governance 2007).

The ultimate objectives of these stringent regulations are to strengthen corporate governance and ensure sustainability of investments in Malaysia. Although it is not mandatory to comply with the Code, listed companies are required to disclose their corporate governance practices and explanations for any deviations from the best practices recommended by the Code in their annual reports (Saleh et al. 2005). The disclosure requirement is a mechanism to encourage companies to adhere with the practices recommended by the Code, since report of deviations may send negative signals to investors (Saleh et al. 2005). The enforcement and regulations of the corporate governance practices in Malaysia appeared to have improved Malaysia’s corporate governance standard in recent times such that the corporate governance standing is on par or similar with other Asian countries like South Korea, Japan and Hong Kong (Mohamad and Muhamad-Sori 2011a).
Since the advent of the Asian Financial Crisis in 1997 to 1998, the Malaysian government has undertaken various reforms to strengthen corporate governance activities in Malaysia to improve investor confidence. A key reform is the introduction and compliance requirements to the Code, which provides the principles of corporate governance best practices. Additionally, reforms in the regulation of financial reporting by Malaysian companies have also shifted towards more transparent and standardised reporting in accordance to international accounting standards, which is adapted as the accounting standards issued by the MASB.

MASB approved accounting standards
All companies in Malaysia are mandated to adhere to the accounting standards issued by the MASB. The overview and development of the MASB accounting standards are discussed in this section.

MASB has been issuing its own accounting standards since its establishment as part of the Financial Services Act 1997. Companies listed on Bursa Malaysia are required by SC to comply with the MASB accounting standards and the Companies Act 1965 requirements when preparing the annual report. The MASB accounting standards are largely adapted from the International Accounting Standards (IAS), which are issued by the International Accounting Standards Board (IASB) (Ng 2006). The IASB was formerly known as the International Accounting Standards Committee (Ng 2006). The IASB comprised of representatives from nine countries based in London and the key functions are to develop high quality, understandable and adoptable international accounting standards, which are transparent and comparable (IASB 2001). All standards issued by the IASB prior to 2002 is referred to as the International Accounting Standards (IAS) while those issued after January 2002 is referred to as the International Financial Reporting Standards (IFRS) (IASB 2001). Since MASB adapts the standards issued by the IASB, compliance with MASB accounting standards ensures that the financial statements are prepared in accordance to internationally recognised standards and standardised for all companies. This should enable investors to analyse objectively and
compare the company’s performance with other companies in Malaysia or in other countries that are prepared in accordance with the international accounting standards.

From 1st January 2005, all MASB Standards was renamed Financial Reporting Standards (FRS), which was merely a change in nomenclature and no change to the accounting standards itself (Ng 2006). MASB has adopted the IAS/IFRS as the reporting accounting standards in Malaysia since 1st January 2006 and these new standards superseded the previous FRS (Ng 2006). Since the previous accounting standards in Malaysia were developed based on the IAS, Malaysian companies reporting in compliance with the MASB accounting standards were already complying with IASB requirements.

All foreign companies listed on Bursa Malaysia are mandatory by law to either report their financial statements based on internationally recognised accounting standards or adhering to the accounting standards approved by MASB (Financial Reporting Act 1997, paragraph 26a), whereas other listed companies must report based on MASB approved standards only (Financial Reporting Act 1997, paragraph 26d). Cash Flow Statements in Malaysia has been mandatory since 1st July 1999 (Ng 2006). This is governed by FRS 107 Statement of Cash Flows, which was developed based on IAS 7 Statement of Cash Flows (MASB 2010).

The accounting standards prescribed by MASB allow some management discretions in determining reported earnings as management has the flexibility to choose and select, to some extent, different accounting techniques (Saleh et al. 2005). Such flexibilities can lead to ambiguity when implementing specific accounting standards, such as depreciation, which can affect the quality and comparability of reported earnings (Saleh et al. 2005). Thus, compliance to the MASB accounting standards does not necessary mean the reported accounting information accurately reflects the underlying economic situation as management can exercise some discretions in managing such information.

The section 2.2 described the background and development of Bursa Malaysia and the regulations that govern the preparation of annual reports in Malaysia. The next section
examine the importance of predicting future cash flows from accounting information in assisting the economic decision making process.

2.3 Importance of Future Cash Flows Prediction

Cash is king, not profits (Keown et al. 2005). Cash receipts must exceed the cash payments in the long term to ensure the sustainability of a business. Companies are concerned with the timing when cash is received, invested and returned to shareholders in the form of dividends (Keown et al. 2005). Users of financial information are mainly concerned with the organisation’s ability to generate favourable cash flows in the future as their decisions are related to amounts, timing and uncertainties of expected cash flows (FASB 1978). Reported accounting information is often used by users to forecast future cash flows as part of their decision making process (Obinata 2002). The demand for cash flow forecasts by capital market investors has been increasing in the United States, especially for companies with volatile earnings, high capital intensive, more choices of accounting practices and large accruals (DeFond and Hung 2003).

Financial analysts forecast the company’s performance on areas such as earnings, cash flows and share prices as part of their main activity (Ramnath et al. 2008). Prior studies have also demonstrated that reported accounting information is an essential source of information for financial analysts in carrying out their decision making process (Chang, Khana and Palepu 2000; Hope 2003a; Hope 2003b). The financial information disclosed by companies should be relevant for assisting in making economic decisions. Accounting information is relevant if it affects the outcome from the decision making process (Riahi-Belkaoui 2004). Predicting future cash flows from accounting information are mainly for the purposes of investment appraisal, securities valuation, assessing long term versus short term investment perspectives, evaluating credit and facilitating decision making, which are elaborated further in sections 2.3.1 to 2.3.5.

2.3.1 Investment appraisal

An investment should be undertaken if it creates value to the investor. Investments in capital assets are often needed to renew, extend or replace assets to enable investors to
increase their wealth or maintain the existing businesses’ profitability in the future (Watson and Head 2007). This section examines the importance of forecasting future cash flows when evaluating investments.

A fundamental financial principle is the time value of money. This relates to the opportunity cost concept in economics of foregoing the earnings potential by not receiving the cash today (Keown et al. 2005). A dollar received today is worth more than a dollar received in the future due to interest foregone if the dollar received today was invested. Discounted cash flow (DCF) valuation is a technique used to value investments by considering the time value of money, which uses an expected rate of return or cost of capital to discount all forecasted future free cash flow back to their present value (Keown et al. 2005; Watson and Head 2007). Free cash flow is the excess net cash flow remaining from the core business operations after deducting capital investments during the period (Gitman, Juchau and Flanagan 2008). It is operating cash inflows over cash outflows surplus that is distributable to the firm’s creditors and shareholders after deducting capital investments in net operating working capital and fixed assets.

The present value of future free cash flows summation is the Net Present Value (NPV) and this measures the value or wealth created when the investment is undertaken (Ross, Westerfield, Jordan, Thompson and Christensen 2004). A common appraisal technique is to forecast the future free cash flows derived from the investment and using an appropriate discount rate, compute the NPV for the investment. Positive NPV indicates that the project can generate a return higher than the expected return or the cost of capital. The acceptance of positive NPV projects is expected to increase shareholders’ wealth (Keown et al. 2005; Ross et al. 2004). If there are limited resources and potential investment projects are mutually exclusive, higher NPV projects are prioritised over the lower ones.

2.3.2 Securities valuation
Cash flows prediction is fundamental when valuing companies and cash flows is the primitive construct for valuation models (Barth et al. 2001). Conventional financial
theories supported this perspective by explaining that the value of an investment is equal to the present value of future cash flows generated from that investment (Brigham et al. 1999; Keown et al. 2005; Ross et al. 2004; Watson and Head 2007).

When a company gets listed, the shares are sold to a variety of investors and these shares are subsequently traded in the secondary capital market. The trading activity that occurred between speculators and investors determines the market value for these shares (Koller, Goedhart and Wessels 2005). Ordinary shareholders are the lowest ranked in the hierarchy of creditors for liquidation proceeds in the event of bankruptcy. Hence, they require the highest compensation when providing capital. Shareholders expect regular returns on their equity investment in the form of dividends and capital gains to be higher than interest charges on borrowings, resulting in the cost of equity higher than the cost of debt (Ross et al. 2004; Watson and Head 2007).

Investors utilise the reported information in the financial statements to estimate the shares’ intrinsic value based on the company’s potential to generate future cash flows and compare with the current price as determined by market forces (Koller et al. 2005). Investors are essentially paying for the expected future performance, not the past performance, nor the historical cost of the assets (Koller et al. 2005). This is supported by evidence from prior studies that the capital market returns is significantly associated with reported earnings (such as Ball and Brown 1968; Dechow 1994; Florou and Chalevas 2010; Rayburn 1986; Richardson et al. 2002; Sloan 1996). Furthermore, prior studies have also reported that financial analysts often use accounting information to forecast the company’s earnings, cash flows and share prices (Ciccone 2005; Ramnath et al. 2008).

2.3.3 Long term versus short term investment perspective
Investors mainly emphasised on the long term investment perspective rather than the short term when forecasting future cash flows to evaluate investments (Koller et al. 2005). Prior studies have documented that the capital markets mainly focused on the company’s long term and less on short term fundamentals (Chauvin and Hirschey 1993; Graham and Frankenerberger 2000). Companies with higher revenue growth and generated
returns on capital invested above the cost of capital achieved higher market valuation (Koller et al. 2005). Deviations from market-wide price are expected to be only temporary and the market should eventually adjust itself to reflect economic fundamentals (Koller et al. 2005). Empirical evidence within the Malaysian context has indicated that cash flows variations are found to affect short term security returns in the Malaysian stock market within a short window period of 3 days but not beyond a longer window period of 51 days (Cheng and Mohamad 2008).

Although the capital market focuses on long term fundamentals, increasing number of managers perceived that the markets are highly responsive to short-term surprises. This has pressured managers to achieve short term results by forsaking long term value creation, such that real economic value is willingly sacrificed to manage reported earnings (Graham, Harvey and Rajgopal 2005). If earnings target were not achieved, this may be perceived as poor management by investors, resulting in the share price reacting adversely in the absence of additional information (Graham et al. 2005). Managers perceived that the capital market misinterprets the company’s announcements and they have to ensure that earnings benchmarks are met to maintain confidence about the company’s performance (Graham et al. 2005).

Such perceptions may be unfounded. Share prices are predominantly driven by long term economic fundamentals such as long term capital returns and growth that results in long term cash flows. Research evidence suggested that share prices did not react negatively when lower earnings are reported, provided the longer-term business outlook for the company is unaffected (Chauvin and Hirschey 1993; Graham and Frankenberger 2000; Koller et al. 2005). Share prices will also react positively to advertising and research and development expenditures on initiatives that create value in the long term, despite negative short-term earnings results (Chauvin and Hirschey 1993; Graham and Frankenberger 2000). Capital expenditure and strategic investment announcements that may negatively impact short-term cash flows and earnings but has long-term growth opportunities can cause positive share price reactions (Woolridge 1988). The higher the
value-creation growth potential from the capital expenditure, the more favourably the share prices will react (Brailsford and Yeoh 2004).

2.3.4 Credit evaluation
Predicting future cash flow from accounting information is an important aspect of credit management. Payments for goods supplied may require immediately payment or deferred to a later agreed date. Lenders or suppliers extending credit to the customer often evaluate the default risk by examining the ability of the customer to meet debt obligations, the resources the company controlled and owned (Bazley, Hancock, Berry and Jarvis 2004).

When assessing the customer’s credit worthiness, the internal and external factors relating to the customer and the environment in which they operate are considered. Such basic factors are (Ross et al. 2004, p. 480):

i) ability to meet credit obligations from operating cash flows,
ii) the willingness to repay credit obligations,
iii) existing financial reserves
iv) security pledged against default
v) general economic situation regarding the customer’s industry

Expected future operating cash flows are forecasted and credit granted only when the net present value (NPV) from providing credit is positive (Ross et al. 2004). Such positive NPV indicates that the present value of the cash inflows or cash repayments made by the borrower, discounted at an appropriate interest rate adjusted for the risk undertaken by the lender, exceeds the present value of the cash outflows given by the lender (Ross et al. 2004).

2.3.5 Facilitate decision making by investors
Investors require financial information for two primary objectives, which is to assess the management’s ability in managing the company’s assets (stewardship objective) and to make decisions about management, investment or potential investments (decision making
objective) (Elliott and Elliott 2007; IASB 2001). However, the IASB (2001, paragraph 14) emphasised that the users’ ultimate objective is to use the historical information to facilitate their economic decision making. The Financial Accounting Standards Board (FASB) in the United States have also emphasised on the importance of predicting future cash flows from financial statements. FASB (1978, paragraph 25) recognised that financial statement users are “generally interested in its ability to generate favourable cash flows because their decisions relate to amounts, timing and uncertainties of expected cash flow”. These perspectives are also shared by the Malaysian Accounting Standard Board (MASB). MASB (2010, paragraph 4) emphasised that users examine a company’s ability to generate cash flows, the timing and the certainty of such cash flows when making economic decisions.

There are many types of users (such as investors, lenders, potential customers, tax authorities and others) that will require financial information for many purposes. However, the IASB (2001, paragraph 10) recognises that the information required by the investor is deemed paramount since investors are providers of risk capital and the information that is relevant to them should also satisfy other users’ requirements. Consequently, the primary purpose of disclosing accounting information is to provide investors adequate and useful information to forecast future cash flows when making economic decisions (Alfredson, Leo, Picker, Pacter, Radford and Wise 2007; Keown et al. 2005; Ross et al. 2004; Watson and Head 2007). The needs of other user groups are deemed secondary and not necessarily disclosed in the financial statements.

A number of countries are increasingly adopting the International Financial Reporting Standards (IFRS) issued by IASB when presenting their financial statements. Since 1st January 2005, Australia and the European Union (EU) have adopted them (Bazley et al. 2004). The IASB and the FASB announced in October 2004 that they are jointly developing a common conceptual framework and “principles-based standards that are internally consistent and internationally converged” (Roberts, Weetman and Gordon 2008, p.348). The MASB has also directed companies to adopt the IFRS/IAS effective from 1st January 2006 (Ng 2006, p.2). This should result in enhancing the international
harmonization of the financial statements, which are prepared in accordance to the accounting standards issued by the IASB and increasing recognition that investors are the primary users of financial statements.

Forecasting future cash flows is important for various purposes, such as valuation of securities, evaluation and selection of investments, capital budgeting, risk and liquidity assessment. It is the foundation for the valuation construct in valuation models (Barth et al. 2001). Financial analysts and investors often use the reported accounting information to assess the ability of the firm to generate sustainable future cash flows as part of making economic decisions. This study is important as it provides a deeper insight on the relevance of reported accounting and operating cash flows information within the Malaysian context in predicting future operating cash flows, thereby assisting investors to make better informed decisions. The next section examines extant literature on the parent disciplines, which are accrual and cash accounting principles.

2.4 Parent Disciplines: Accrual and Cash Accounting

When forming the basis of the research, a researcher must narrow the research topic from a broad perspective to a narrowed focus by reviewing literature on the parent and immediate disciplines and identify research gaps in the current body of knowledge (McMurray 2008). This section evaluates the extant literature on the two parent disciplines, which are accrual and cash accounting principles. The underlying concepts, relevance and issues relating to accrual accounting principles as the primary basis for preparing financial statements are examined in section 2.4.1 while those relating to cash accounting principles are evaluated in section 2.4.2.

2.4.1 Accrual accounting

The objectives of financial statements are primarily to provide information about the financial position, performance and variations in the financial position of the company to enable users to make economic decisions (IASB 2001, paragraph 12). This section examines the principles, relevance and issues relating to the accrual accounting system,
which is the generally accepted accounting convention recommended by the IASB (2001, paragraph 22) when preparing financial statements.

Accrual accounting is a method of accounting whereby revenue and expenses are identified and reported in the accounting periods when the activity occurred, independent from the timing when cash is received for the income or cash paid for the expense. (Bazley et al. 2004; Elliott and Elliott 2007; Keown et al. 2005; Richardson et al. 2002). Economic transactions under this basis are segmented into the reporting periods when the activity occurred and not necessarily in the same period as the timing of cash flows relating to these transactions. When reporting the firm’s financial performance, the accounting standards board in the United States (FASB 1978) highlighted that the relevance of information reported under accrual accounting on the company’s ability to generate continuing cash flows is superior to the limited information content of cash receipts and payments. The financial statements prepared under the accrual convention not only provided information about historical transactions that involved cash receipts and payments but also reported information on future obligations of cash payments or future benefits of cash receipts, which are useful for making economic decisions (Elliott and Elliott 2007; IASB 2001).

2.4.1.1 Revenue recognition and matching principles
The derivation of accounting earnings or net income from the accrual process is based on two fundamental accounting principles: revenue recognition and matching principles. The revenue recognition principle recommends that the financial statements recognise revenue when an economic transaction has occurred that has a reasonable certainty of cash receipt (Dechow 1994). Revenue is recognised when the transaction involved the sale of goods in which the significant risks and rewards have been transferred from seller to buyer and there is no significant uncertainty regarding the consideration for the sale, costs incurred and goods returned (IASB 2001, paragraph 14). The matching principle simultaneously recognises both the revenue and expenses associated directly or jointly to the same transactions or other events in the same accounting period (IASB 2001, paragraph 95). The revenue derived from the activities is recorded or matched within the
same period as the expenses incurred in generating the revenue, irrespective of the cash flows timing.

Accrual accounting results in earnings or profit, which is the net difference between revenue and expenses or the difference between the opening and closing net assets (Cotter 1996; Elliott and Elliott 2007). Expenses are considered traditionally to measure efforts expended while revenue is measuring accomplishment and the resultant net effect, which is earnings, indicate the firm’s operational effectiveness (Godfrey et al. 2006). Earnings are used widely as a key performance measurement of the managers’ ability in discharging their stewardship role when managing the resources entrusted to them (Dechow 1994). Since the management makes the decision regarding the firm’s activities, then the profit or net income is deemed an indicator of the firm’s effectiveness in managing these resources (Godfrey et al. 2006). Consequently, management compensation contracts or bonuses paid to managers are often tied to earnings-based performance targets or growth rates (Guidry, Leone and Rock 1999; Healy 1985). This is to ensure that the management rewards are aligned with the interest of shareholders by generating growth in earnings to create value.

2.4.1.2 Assets and liabilities arising from accrual accounting

The previous section described the derivation of earnings from the accrual accounting process. This section discusses on the derivation of assets and liabilities from the accrual accounting process.

Any changes in resources or activities conducted that have an economic impact to the company are captured under accrual accounting in the period in which it occurred, irrespective of the cash flow timing arising from the activities. This gives rise to assets and liabilities in accrual-based reporting. An asset is a resource controlled by a company resulting from past events, only recognised when it is probable that future economic benefits are expected to flow from that entity and the cost or other value can be reliably measured (IASB 2001, paragraph 49a). A liability is an obligation arising from past events, which causes outflow of resources from the entity on settlement (IASB 2001,
 Liability is only recognised when it is probable that the obligation will be settled and the amount of settlement must be reliably measured (IASB 2001, paragraph 49b). The absence of accrual accounting means that all assets and liabilities are cash (Richardson et al. 2002).

Assets are distinguished between current and non-current assets in financial reporting. Current assets are those assets that are (IASB 2005, paragraph 57):

1. expected to be realised or held for sale or consumption within the normal operating cycle of the entity or
2. held for short term trading purposes and expected to realise within 12 months of the balance sheet date or
3. cash or cash equivalents, which usage is not restricted.

Examples of current assets are stock, accounts receivable, accounts payable, prepayments and cash.

A non-current asset is an asset that is not categorised as a current asset (IASB 2005, paragraph 57). Examples of such assets are plant and machinery, vehicles and furniture. Under the matching principle, the utilisation of the non-current assets during the course of business is matched with the economic benefits derived from the assets when reporting financial performance. The extent of such sacrifice is expensed in the form of depreciation (for tangible assets) or amortisation (for intangible assets). Depreciation is the allocation of cost in a systematic manner over the economic useful life of the asset (IASB 2004, paragraph 6). The depreciation method used should reflect the consumption pattern of the asset’s economic benefits (IASB 2004, paragraph 60).

The matching exercise requires some discretionarly judgement when matching expenses (effort) with the revenue (accomplishment) within the same reporting period. For example, when payments are made to acquire an asset, the costs of acquiring the asset is allocated or spread over a period of time to match with the revenue generated from utilising the asset. Estimating the length of economic useful life to defer the costs may
require judgement, which can be a difficult and subjective process. The practice recommended by the Accounting Standard Board in the United Kingdom is to allocate based on a straight-line depreciation method if the pattern of consumption of the asset’s economic benefit is uncertain (ASB 1999, paragraph 81). Applying this practice, the asset is depreciated in equal amounts over the estimated economic useful life.

Liabilities can be differentiated between current liabilities and non-current liabilities in financial reporting. A current liability is an obligation that is expected to be settled within the normal operating cycle of the entity or within 12 months from the balance sheet date (IASB 2005, paragraph 60). Examples of current liabilities are accounts payable, overdraft and accruals. A non-current liability is a liability that is not classified as a current liability (IASB 2005, paragraph 60). These are long term obligations owed to another entity that are due for settlement after one year.

2.4.1.3 Historical cost convention

The previous section described the derivation of assets and liabilities resulting from the accrual accounting process. This section describes the recording of historical cost under the accrual accounting process.

Following the accrual accounting process, economic transactions are recorded in the currency and price in which the transaction occurred irrespective of the cash flows timing relating to these transactions. This forms the basis of historical cost accounting convention. Activities are recorded and valued on the day it occurred under the historical cost convention (Elliott and Elliott 2007). Historical information is reported in two aspects, the first aspect reports transaction that has occurred in a past period and the second aspect values the past transaction at the (historical) cost when the transaction occurred (Elliott and Elliott 2007).

The financial statements prepared under the historical cost convention are based on actual past transactions that have occurred. Consequently it is deemed relatively objective, less subjective, factual and verifiable with independent documentary evidence such as
invoice, receipt and cheque counterfoil (Elliott and Elliott 2007; Godfrey et al. 2006). This provides quantitative verifiable evidence that can be used to objectively assess the management stewardship function when executing their roles and responsibilities.

Critics argued that users will want to use accounting information for decision making and suggested that the information should be more reflective of current market values and less historical (Chambers 1966; Edwards and Bell 1961; Shanahan 1992; Sterling 1970). It may not reflect the ‘true and fair’ perspective of the firm during times of high inflation when asset prices are increasing and the financial statements reflect assets at historical prices (Elliott and Elliott 2007). For example, non-current assets such as buildings, plant and machinery acquired in the past are valued at historical cost that can be substantially different from the current market value. Asset values maybe mismatched as the non-current assets, such as plants and machinery, acquired years ago are valued at out-dated historical cost while the current assets, such as stock, are valued at more current prices. This mismatching of valuation may result in inaccurate performance evaluation by financial statement users.

The historical cost convention is mainly relevant for stewardship function purposes while reported figures that have been revised for inflation effects are probably more useful for decision making purposes (Elliott and Elliott 2007). Nevertheless, proponents of historical cost convention emphasised that the past information is relevant to decision making as it enable users to evaluate the quality and impact of past decisions and provide the basis to forecast future prices (Godfrey et al. 2006).

### 2.4.1.4 Going concern principle

The previous section described the historical cost convention basis when reporting the values of historical activities. The next section describes the going concern principles when preparing financial statements.

The financial statements are prepared on the basis that the company is expected to remain in business in the foreseeable future, known as the going concern principle (Bazley et al. [2006]).
Management is required to review information about the future to assess the sustainability of the company, at least for the next twelve months from the end of the current reporting period when assessing this assumption (IASB 2001, paragraph 26). This may involve an assessment of the entity’s liabilities, liquidity, business environment conditions, significant operational issues such as loss of key personnel, regulatory changes and other events that may have significant adverse impact on the company.

2.4.1.5 Earnings composition: operating cash flows and accruals

This section examines the nature of the components within earnings. Earnings or net income reported under the accrual accounting basis is a combination of accruals and cash flows (Dechow 1994; Dechow and Dichev 2002; Dechow et al. 2008). This can be illustrated as follows:

\[
\text{Earnings} = \text{Cash flow from operations} + \text{accruals}
\]

Accruals are determined as variation of the non-cash working capital elements of the balance sheet items, such as accounts receivable changes, accounts payable changes and inventory changes, depreciation and amortisation expenses, which can be illustrated as follows (Cheng and Hollie 2008):

\[
\text{Accruals} = \text{changes in non-cash working capital} - \text{depreciation/amortisation expenses}
\]

Following from this, earnings can be disaggregated into the operating cash flows and accrual components of earnings as follows:

\[
\begin{align*}
\text{Earnings} & = \text{Cash flow from operations} + \text{accruals} \\
& = \text{Cash flow from operations} + \text{changes in non-cash working capital} - \text{depreciation/amortisation expenses}
\end{align*}
\]

Accruals are resulted from the recording of activities in the accounting period in which it occurred and the cash flows relating to these activities are deferred to a future reporting
period. The timing differences will eventually net off over the long term period and accruals should inevitably realise into cash and equalise with the cash flows over the life of the company.

2.4.1.6 Accrual-based is more subjective than cash-based accounting information

The previous section examined the nature of the components of earnings, which is a combination of operating cash flows and accruals. This section examines the subjective nature of accrual accounting information compared to cash accounting information.

Accrual-based accounting information, such as earnings, may have higher subjectivity than cash flows measurement. The accrual components of earnings consist of future cash flow estimates, past cash flow deferrals, allocations and valuations that are often subject to management estimations and discretions (Dechow et al. 2008). These estimations under the accrual basis may involve multiple and complex assumptions about future events. Critics of accrual accounting argue that unsophisticated users often struggle to comprehensively understand the suite of information within accrual-based financial reports (Athukorala and Reid 2003). In contrast, cash information is more objective and simplistic in nature as it only records cash payments and receipts when it occurred.

The allocation of periodic cash flows under accrual accounting may also form the basis for income manipulations or earnings management. Earnings management is the intentional structuring of transactions or accounting practices to manipulate financial reporting to mislead stakeholders’ perception about the organisation’s real economic performance (Graham et al. 2005). Firms manage earnings when there is an expectation of losses, decline in earnings or not meeting investor expectations (Healy and Wahlen 1999). Empirical studies that have examined a large cross section of companies revealed that managers overstate earnings before equity offerings (Erickson and Wang 1999; Rangan 1998; Teoh, Welch and Wong 1998; Teoh, Wong and Rao 1998). For example, firms were found to increase their earnings to avoid reporting lower than the analysts’ forecasts (Burgstahler and Dichev 1997) and banks use several techniques to manage their regulatory capital (Collins, Shackelford and Wahlen 1995). Management
compensation contracts can also result in incentives for earnings management (Watts and Zimmerman 1990). Managers have the incentive to use accounting policies to enhance their performance as the bonuses are often tied to some kind of accounting performance indicators, such as net income or sales (Guidry et al. 1999; Healy 1985). Earnings are also managed to ensure that their reported earnings are not in breach of external contract obligations, such as debt covenants (DeFond and Jiambalvo 1994; Sweeney 1994; Watts and Zimmerman 1990).

Nevertheless, the subjective nature of accrual accounting does not necessarily imply that cash-based accounting is superior to accrual-based reporting when measuring performance since cash-based information can also be easily manipulated. For example, cash information can be manipulated by changing the cash payment and receipt dates, selecting favourable accounting policies and categorising capital items as current items or vice versa (Diamond 2002).

In summary, accrual-based accounting information, such as earnings, is expected to provide a superior performance measurement since accrual accounting convention eliminates timing and matching variability problems encountered with cash receipts and payments reporting. Accrual accounting is preferred by accounting standard setters as it provides more comprehensive and relevant information than cash-based accounting information in facilitating the decision making process (IASB 2001). Additionally, accrual-based earnings are useful and informative in measuring performance and as a basis for valuation construct. However, the nature of accrual components are criticised as subjective and can be manipulated to distort the performance of earnings.

2.4.2 Cash accounting

The previous section 2.4.1 described the principles and characteristics of accrual accounting principles when reporting performance. This section examines the principles, characteristics and issues associated with cash accounting principles and in comparison with accrual accounting principles.
The principle of cash accounting recognises only cash transactions, such as recording cash receipts as income and cash payments as expenses (Birt, Chalmers, Beal, Brooks, Byrne and Oliver 2008). Earnings are recorded in the accounting period only when revenue and expenses are realised into cash during that accounting period, which contrasts with accrual accounting. Cash accounting is more prudent than accrual accounting as it records only realised cash flows and does not anticipate with reasonable certainty the occurrence of cash flows (Elliott and Elliott 2007).

There are fewer assumptions involved in cash accounting and the reported cash transactions can be checked and confirmed. Only actual cash transactions that occurred are reported under cash accounting and it does not anticipate cash flows, while accrual accounting report transactions that are reasonably certain will occur. Consequently, there are fewer requirements for accounting standards or accounting policies disclosures under cash accounting, such as depreciation methods, compared to accrual accounting (Elliott and Elliott 2007). Decision makers, policymakers, the media, credit rating agencies and the public often find it difficult to comprehend all the information reported in the accrual-based financial statements (Athukorala and Reid 2003). Cash-based information is generally more easily comprehensible by unsophisticated users than accrual-based information.

2.4.2.1 Objective nature of cash flow information

Cash accounting is arguably more objective than accrual accounting since there is less subjective management judgement when determining the values to be reported in the financial statements (Athukorala and Reid 2003; Elliot and Elliot 2007). Net income reported under accrual accounting is subject to assumptions and estimations, which may be distorted due to management biasness (Dechow et al. 2008). Furthermore the concept of prudence is biased under accrual accounting as it recommends that when there is uncertainty, avoid overstating gains and assets and also avoid understating losses and liabilities (Elliott and Elliott 2007). Cash accounting is based on facts and not influenced by management discretions. It reports information in a neutral, factual manner and free from management discretions. The objective nature of cash flows information will also
assist in comparing the performance of companies and overcome accounting treatment differences that may arise using accrual accounting (Chotkunakitti 2005; IASB 2001).

Reporting using cash accounting has a confirmatory value in assisting users to confirm or correct past assessments (Elliott and Elliott 2007). External users of financial statements are keen to evaluate the entity’s ability to generate future cash flows to pay dividends (Elliott and Elliott 2007; Seng 2006). Cash flow information is important as it forms a basis for forecasting future cash flows. Historical cash flow information enables users to evaluate the accuracy of previous future cash flows forecasts, assess the relationship between net cash flow and profitability and effects from price changes (MASB 2010). This is supported by prior studies (such as Barth et al. 2001; Bowen, Burgstahler and Daley 1986; Waldron and Jordan 2010; Wilson 1986) that have provided empirical evidence that past cash flows are significantly related to future cash flows.

2.4.2.2 Cash flow statement accounting standard in Malaysia

The previous section examined the objective and confirmatory value of cash accounting. This section examines the accounting standard, FRS107, which regulates the reporting of cash transactions when preparing the cash flow statement.

Although earnings using accrual accounting is the preferred primary information, the importance of historical cash flows information in decision making is also recognised by the authorities. The Malaysian accounting standard, FRS 107, governs the preparation and reporting of the Statement of Cash Flows in Malaysia (MASB 2010). This standard emphasises that historical cash flow information is useful for evaluating the “amount, timing and certainty of future cash flows” (MASB 2010, paragraph 5). FRS 107 (MASB 2010, paragraph 4) declared that cash flows information enable users to evaluate the ability of the company in generating future cash flows and develop valuation models to examine and compare the present value of future cash flows of various companies. FRS107 is derived from the IAS 7 Statement of Cash Flows issued by IASB (Ng 2007). Hence, adhering to FRS107 will also ensure compliance to IAS 7. It is mandatory for
companies in Malaysia to publish the cash flow statement for activities conducted after 1st July 1999 (Ng 2006).

FASB in the United States shared similar perspectives with other accounting standard setters that the cash flow statement provides essential information to assess the relationship between earnings and cash flows. It provides the “amounts, causes and intervals of time between earnings and comprehensive income and cash receipts and outlays” (FASB 1978, paragraph 53).

When preparing the cash flow statement, cash flows comprised of cash and cash equivalents. Cash are cash on hand and bank deposits while cash equivalents are short term, non-risky and liquid investments that are readily convertible to cash (MASB 2010, paragraph 6). Cash equivalents are those held for three months or less from the acquisition date to meet short-term cash requirements (MASB 2007, paragraph 7).

The cash flow statement classified the cash flows that transpired during a specific period into three categories: operating, investing and financing categories. Operating cash flows are mainly derived from the primary revenue generating activities of the firm (MASB 2010, paragraph 14), while cash flows from investing activities relate to the spending on long term resources that are expected to produce foreseeable income and cash flows (MASB 2010, paragraph 16). Cash flows from financing are mainly proceeds and payments relating to the providers of capital to the company (MASB 2010, paragraph 17).

Information on the operating cash flows provides an important indicator of the extent to which the company is able to generate adequate cash flows to repay and service liabilities, maintain operating activities, pay dividends and provide internal source of finance for investments (MASB 2010, paragraph 13). Examples of operating cash flows are cash receipts from goods sold and provision of services, cash receipts earned from royalties, fees and commissions, cash payments for goods and services procured from suppliers and cash payments to employees (MASB 2010, paragraph 14). The standard
recognise that operating cash flows information is useful for predicting future operating cash flows but only when used jointly with other information (MASB 2010, paragraph 13).

FRS107 allowed the choice of two methods to be selected when presenting cash flow from operations. The first method is the *direct method*, in which major categories of gross cash inflows (receipts) and outflows (payments) from operating activities are reported (MASB 2010, paragraph 18). The second method is the *indirect method*, which recommended reconciling the profit or losses to the operating cash flows with adjustments for non-cash transactions (such as provisions and depreciation), any deferrals or accruals relating to future operating cash flows and items relating to investing and financing activities (MASB 2010, paragraph 18).

The indirect method is arguably easier to prepare than the direct method (Golub and Huffman 1984). However, users (Jones and Widjaja 1998) and accounting standard setters (FASB 1978; IASB 2009; MASB 2010) preferred the direct method as it provided additional relevant information when forecasting future operating cash flows compared to the indirect method. The indirect method has drawbacks, namely due to the variety of existing reporting practices, changes in reporting entity (such as mergers and acquisitions), absorption costing used when valuing stock and other factors (Dritina and Largay 1985). Empirical studies generally supported the direct method in providing more relevant information than the indirect method (Arthur and Chuang 2006; Clinch, Sidhu and Sin 2002; Krishnan and Largay 2000; O’Leary 1988). The direct method presents the operating cash cycle better and more easily understood by users with minimal accounting knowledge compared to the indirect method (O’Leary 1988). Direct method is also superior to the indirect method in predicting future cash flows, especially for one-year ahead cash flow from operations (Krishnan and Largay 2000).

Users can estimate the free cash flows (FCF) of the company by using information from the cash flow statement. Free cash flows are the excess cash flows derived from the
principal business activities after meeting the capital investment requirements (Keown et al. 2005; Koller et al. 2005). This can be computed as follows (Keown et al. 2005):

Free cash flows (FCF) = Cash flow from operations – changes in net operating working capital – fixed asset investments

The firm can be valued by discounting the FCF using an appropriate discount rate to reflect the riskiness of the firm, such as the weighted average cost of capital (Koller et al. 2005). The weighted average cost of capital is the firm’s capital costs blended in proportion to the actual dollar amounts from all the firm’s financing sources (Keown et al. 2005; Koller et al. 2005). It is the opportunity cost of financing to the firm, which is the combined required return by the debt and equity holders.

This section examined the accounting standard in regulating cash flow statement preparation. The next section examines the timing and matching issues associating with reporting using cash accounting.

2.4.2.3 Timing and matching issues with cash accounting

Despite the benefits from cash accounting, accrual accounting is primarily the recommended standard accounting practice for companies (FASB 1978; IASB 2001). This is because cash flows have inherent timing and matching issues compared to earnings, which may result in distortions when measuring performance (Dechow 1994). When the timing of the cash receipts and the associated payments does not occur concurrently, mismatches between cash inflows and cash outflows occurs under cash accounting. This may result in distortion when measuring performance, especially when the transaction straddles over two reporting periods.

For example, distortions in performance can occur when goods are initially bought on credit and sold for cash in the first reporting period but payment made in the second reporting period. Under cash accounting, the company records the cash received for the goods sold as income in the first period. Since no cash payments were made during this
first period, no expenditure is recorded. This results in a positive net income in the first period. The expenditure for this goods is only recorded when cash payments are made, which occurred in the second period. Thus, the second period will report a negative net income. Such income and expenditure mismatching under cash accounting basis may distort the company’s financial performance. Whereas under the accrual basis, the income from the goods sold and the expenditure from the goods purchased are matched and reported within the same period based on the date when the transaction occurred, independent of cash receipts or payments timing. This results in a smoother and less distorted performance reporting. Hence, the accruals accounting process enhance the usefulness of accounting information by removing the matching and timing problems associated with cash flows accounting (Birt et.al 2008; Bowen, Burgstahler and Daley 1987; Cheng, Liu and Schaefer 1997b; Chotkunakitti 2005; Dechow 1994; Penham and Yehuda 2009).

2.4.2.4 Cash accounting is less comprehensive than accrual accounting

The previous section 2.4.2.3 described the inherent timing and matching issues present in cash accounting. This section examines the lack of information comprehensiveness associated with cash accounting information.

Accrual accounting provides more complete information on managing resources than cash accounting. Cash flow information is criticised for not indicating relationships between periods as many current cash payments and receipts are derived from earlier periods and not intended for future periods (FASB 1978, paragraph 24c). Cash accounting does not record assets and liabilities whereas all the assets and liabilities of the entity arising from past events are recorded under accrual accounting. The more comprehensive reporting of assets under accrual accounting can facilitate managers in asset management, better maintenance programs and replacement policies, identify and manage surplus assets and managing risk from theft or damage (Athukorala and Reid 2003).
Furthermore, accrual accounting allows users to identify payments that are in arrears, unlike cash-based reporting (Athukorala and Reid 2003). The recording of liabilities enabled users to evaluate the timing and the extent of the obligations falling due. This enables a better assessment on the impact to future cash flows and the liquidity of the company.

In summary, accrual accounting records more relevant information but less reliable compared to cash accounting. The estimated future benefits and obligations in the accruals can be considered relevant. However, due to the subjective elements and potential for earnings manipulation, accrual-based information may be less reliable compared to the more objective nature of cash receipts and payments information prepared under the cash accounting basis (Dechow et al. 2008; Obinata 2002). A compromise may be required between the relevance and reliability aspects of financial information. Although cash flow information is not a substitute for earnings, it is recognised to provide supplementary information to earnings (FASB 1978; MASB 2010). The cash flows information, which is more objective, can be used to enhance and complement the overall usefulness of accrual-based information, such as earnings, in facilitating the economic decision making process of financial statement users. The comparison between these two accounting principles, accrual and cash accounting, are summarised in Table 2.1
Table 2.1 Key differences between accrual and cash accounting principles

<table>
<thead>
<tr>
<th>No.</th>
<th>Accrual Accounting</th>
<th>Cash Accounting</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>All economic transactions that occur in the financial period are reported, irrespective of the cash flows timing.</td>
<td>Only cash transactions that realise in the financial period are reported.</td>
</tr>
<tr>
<td>2</td>
<td>Revenue is recognised and matched with the related expenses, independent of the cash flow timing.</td>
<td>Revenue recognised when cash received and expenses recognised when cash paid.</td>
</tr>
<tr>
<td>3</td>
<td>Better performance measurement since smoother reported earnings when netting revenue and expenses.</td>
<td>Mismatching occurs if cash receipts and payments straddle over several periods, resulting in significantly varying earnings. This may result in distortion in performance measurement.</td>
</tr>
<tr>
<td>4</td>
<td>Difficult to prepare and requires subjective judgement.</td>
<td>Easier to prepare, objective and factual.</td>
</tr>
<tr>
<td>5</td>
<td>Recommended by accounting standards as primary basis for financial statements preparation.</td>
<td>Recognised by accounting standards as only providing supplementary information.</td>
</tr>
<tr>
<td>6</td>
<td>Complex and governed by numerous policies.</td>
<td>Simpler and governed by fewer policies.</td>
</tr>
<tr>
<td>7</td>
<td>Comprehensive as includes cash and other relevant information, such as resources (assets) and obligations (liabilities). Useful in managing resources and commitments.</td>
<td>Less comprehensive as only report cash information.</td>
</tr>
<tr>
<td>8</td>
<td>Information on asset utilisation provided.</td>
<td>No information provided.</td>
</tr>
<tr>
<td>9</td>
<td>Relevant but less reliable</td>
<td>Reliable but less relevant.</td>
</tr>
</tbody>
</table>

Source: Developed from extant literature.

2.5 Immediate Discipline

The previous section 2.4 examined and highlighted the nature and differences between the two parent disciplines, which are principles of accrual and cash accounting. This section reviews the immediate discipline, which are comparative studies on the abilities of earnings, accruals and operating cash flows information in predicting future operating cash and are broadly categorised into two main research themes. The first main research
theme are comparative studies on the abilities of earnings versus operating cash flows in predicting future operating cash flows, which is discussed in section 2.5.1. The second main research theme are comparative studies on the abilities of earnings, accruals and operating cash flows for future operating cash flows prediction, which is examined in section 2.5.2. Prior studies have documented that earnings, accruals and operating cash flows information are relevant in predicting future operating cash flows but the relative predictive abilities remain contradictory.

2.5.1 Comparative abilities of earnings and operating cash flows in predicting future operating cash flows

This section examines the first main research theme that compared the predictive abilities of earnings versus operating cash flows for future operating cash flows. Empirical studies have documented that both earnings and operating cash flows information are able to predict future operating cash flows (such as Barth et al. 2001; Dechow et al. 1998; Ebaid 2011; Habib 2010; Pae 2005; Waldron and Jordan 2010). However, extant literature is contentious on the comparative abilities of earnings versus operating cash flows information for future operating cash flows prediction.

Some prior studies have supported the assertion of accounting standards that historical earnings have superior predictive ability compared to historical operating cash flows (such as Dechow, et al. 1998; Ebaid 2011; Greenberg, Johnson and Ramesh 1986; Kim and Kross 2005; Murdoch and Krause 1989 and 1990; Pae 2005). Other studies have documented that historical operating cash flows are superior predictor of future operating cash flows compared to historical earnings (such as Arthur, Czernkowski and Chen 2007; Barth et al. 2001; Chotkunakitti 2005; Farshadfar et al. 2008; Habib 2010; Penham and Yehuda 2009; Seng 2006; Waldron and Jordan 2010). A few prior studies have indicated no discernible differences between these two types of information (Arnold et al. 1991, McBeth 1993; Pfeiffer et al. 1998).

Most of these studies were predominantly conducted in the developed countries with large economies and matured capital markets, namely the United States (such as Barth et
al. 2001; Dechow et al. 1998; Finger 1994; Greenberg et al. 1986; Murdoch and Krause 1989 and 1990; Waldron and Jordan 2010), Australia (Arthur and Chuang 2006; Farshadfar et al. 2008; Habib 2010; Percy and Stokes 1992), United Kingdom (Al-Attar and Hussain 2004; Arnold et al. 1991) and New Zealand (Scholer 2006; Seng 2006). Only a few studies were conducted in developing countries with smaller economies and emerging capital markets, such as Egypt (Ebaid 2011), Indonesia (Supriyadi 1998) and Thailand (Chotkunakitti 2005).

Research has also indicated that different industry characteristics with varying earnings volatility and sizes have different influence on future cash flows (Dechow and Dichev 2002; McNichols 2002; Palepu et al. 2000). Majority of prior future operating cash flows prediction studies have pooled information from a cross section of industries, which may be influenced by differences in industry characteristics with varying operating cycles, earnings volatility and cash flows. Consequently the findings from prior studies may be unreliable since these studies have examined a cross section of companies and failed to distinguish the effects of each industry.

Prior studies on the comparative abilities of earnings versus operating cash flows for future operating cash flows prediction remain contradictory and inconclusive and are summarised in table 2.2. The next sections 2.5.1.1 to 2.5.1.3 summarised other findings from reviewing this first major research theme of comparative studies on earnings versus operating cash flows as predictors of future operating cash flows.
Table 2.2 Summary of prior studies on the comparative abilities of earnings and operating cash flows in predicting future operating cash flows

<table>
<thead>
<tr>
<th>Earnings is superior</th>
<th>Operating cash flows is superior</th>
<th>No discernible difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Largay and Stickney (1980);</td>
<td>1. Bowen, Burgstahler and Daley (1986);</td>
<td>1. Arnold, Clubb, Manson and Wearing (1991);</td>
</tr>
<tr>
<td>2. Gombola and Ketz (1983);</td>
<td>2. Austin and Andrew (1989);</td>
<td>2. Pfeiffer, Elgers, Lo and Rees (1998);</td>
</tr>
<tr>
<td>5. Percy and Stokes (1992);</td>
<td>5. Quirin, O’Bryan, Wilcox and Berry (1999);</td>
<td></td>
</tr>
<tr>
<td>6. Finger (1994);</td>
<td>6. Krishnan and Largay (2000);</td>
<td></td>
</tr>
<tr>
<td>7. Simons (1994);</td>
<td>7. Barth, Cram and Nelson (2001);</td>
<td></td>
</tr>
<tr>
<td>8. Charitou and Vafeas (1998);</td>
<td>8. Stammerjohan and Nassiripour (2001);</td>
<td></td>
</tr>
<tr>
<td>9. Dechow, Kothari and Watts (1998);</td>
<td>9. Al-Attar and Hussain (2004);</td>
<td></td>
</tr>
<tr>
<td>10. Kim and Kross (2005);</td>
<td>10. Chotkunakitti (2005);</td>
<td></td>
</tr>
<tr>
<td>11. Pae (2005);</td>
<td>11. Seng (2006);</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15. Habib (2010);</td>
<td></td>
</tr>
</tbody>
</table>

Source: Developed from extant literature.

2.5.1.1 Future operating cash flows proxies

Early research on comparing the predictive abilities of earnings and operating cash flows used estimated cash flows from operating activities as proxies for future operating cash flows (Gombola and Ketz 1983; Greenberg et al. 1986; Largay and Stickney 1980). The estimated operating cash flows was mainly derived from adjusting net income before extraordinary items and discontinued operations for depreciation and amortisation.
charges, changes in non-cash current assets and current liabilities. However, these early studies adopted different cash flows definitions when estimating the future operating cash flows proxies. Some studies considered only operating activities and excluded financing activities, such as changes in notes payable and long term liabilities (Bowen et al. 1986; Greenberg et al. 1986; Largay and Stickney 1980; Quirin et al. 1999), whereas other research included cash flows from both operating and financing activities (Gombola and Ketz 1983). These early studies developed and tested earnings and cash flow models using multiple linear regression analysis and generally supported the perspective that earnings are superior to operating cash flows in predicting future operating cash flows.

Recent studies have mainly used actual operating cash flows as proxy for future operating cash flows when investigating the relative predictive abilities of accrual-based accounting information and operating cash flows (such as Arthur, Czernkowski and Chen 2007; Barth et al. 2001; Chotkunakitti 2005; Ebaid 2011; Farshadfar et al. 2008; Habib 2010; Penham and Yehuda 2009; Waldron and Jordan 2010). Cash flows from financing activities (such as changes in notes payable and the current portion of long term debt from current liabilities changes) and investment activities were excluded from these studies. These recent studies mainly concluded that operating cash flows are superior to earnings for future operating cash flows prediction, which contradict earlier studies. These conflicting findings could be due to the use of actual operating cash flows, which is deemed more accurate compared to the estimated operating cash flows. This is discussed further in the following section.

2.5.1.2 Predictive ability of actual versus estimated operating cash flows
This section examines prior studies that have compared the ability of estimated operating cash flows versus actual operating actual cash flows in predicting future operating cash flows. The findings generally revealed that actual operating cash flows are superior predictor of future operating cash flows than estimated operating cash flows (Farshadfar et al. 2008; Quirin et al. 1999; Seng 2006).
An early study conducted in Australia by Percy and Stokes (1992) based on Australian companies for the period 1974 to 1985 reported that estimated operating cash flows derived from the balance sheet were superior to actual operating cash flows in predicting future operating cash flows. However, more recent studies based on New Zealand firms (Seng 2006) and Australian firms (Farshadfar et al. 2008) refuted this evidence. Farshadfar et al. (2008) examined a sample of 323 Australian firms for the period from 1992 to 2004 using ordinary least square univariate regression model. They compared reported cash flow from operations (CFO) with two traditional cash flow measurements (similarly used by Bowen et al. 1986), which are income after tax but before extraordinary items plus depreciation and amortisation expense and working capital from operations. Actual reported operating cash flows were reported as superior to these traditional cash flows measurements and earnings in predicting one-year ahead future operating cash flows (Farshadfar et al. 2008). The predictive ability is also reported to be proportional to company size such that the larger the company, the stronger is the predictive power of actual operating cash flows (Farshadfar et al. 2008). Seng (2006) compared the ability of actual operating cash flows, traditional cash flow measurements and earnings in predicting one and two period-ahead cash flows for 213 companies listed on the New Zealand stock exchange during the period 1989 to 1992. Actual operating cash flows were concluded by Seng (2006) as superior to estimated operating cash flows in predicting future operating cash flows for New Zealand companies.

Actual cash flows have more incremental information and superior to estimated cash flows in predicting future cash flows (Austin and Bradbury 1995; Bahnson, Miller and Budge 1996; Collins and Hribar 2002). When deriving cash flows from the balance sheet, it tend to result in distorted and biased estimates since estimated cash flows may contain errors and defective compared to actual cash flows (Austin and Bradbury 1995; Collins and Hribar 2002). Consequently early studies that derived estimated operating cash flows by adjusting earnings, such as those used by Bowen et al. (1986), Finger (1994), Gombola and Ketz (1983), Greenberg et al. (1986), Largay and Stickney (1980) and Percy and Stokes (1992), may contain errors resulting in unreliable findings compared to the more recent studies using reported realised operating cash flows, such as Al-Attar and

2.5.1.3 Multiple linear regression models as proxies for future operating cash flows prediction models

The previous section compared the reliability of findings between using estimated versus actual operating cash flows in the prior studies. This section discusses on the statistical techniques used in prior studies to develop future operating cash flows prediction models.

Majority of prior research adopted the least-square technique to develop multiple linear regression models as proxies for the prediction models. The least-squares technique seeks to determine the regression model that best fits the collected data by minimising the squared deviations between the actual data and regression model (Field 2009; Levine, Stephan, Krehbiel and Berenson 2008). With regression analysis, the predicted variable is known as the dependent variable while the variable that makes the prediction is known as the independent or predictor variable (Field 2009; Levine et al. 2008). Recent studies have mainly used actual operating cash flows as proxy for future operating cash flows and as the dependent variable (such as Arthur, Czernkowski and Chen 2007; Barth et al. 2001; Chotkunakitti 2005; Ebaid 2011; Farshadfar et al. 2008; Habib 2010; Penham and Yehuda 2009; Waldron and Jordan 2010) while the predictor variables are past period-lags of accrual-based accounting information and operating cash flows.

Some studies have used only one predictor while others have used multiple predictors in the prediction models. Prior studies such as Farshadfar et al. (2008), Percy and Stokes (1992) and Waldron and Jordan (2010) have developed simple regression or univariate models to examine prediction for one-year ahead future operating cash flows with only one predictor. For example, Waldron and Jordan (2010) examined the comparative predictive abilities of earnings and operating cash flows in predicting future operating cash flows for three related industries, the biotechnology, telecommunications and the Information Technology industry in the United States during periods of economic turbulence between 1994 and 2004. They developed two simple regression models as
future operating cash flows prediction models using only past one year earnings predictor in one model and past one year operating cash flows predictor in another model. The predictive ability of operating cash flows was documented by them as superior to earnings in predicting one-year ahead cash flows during periods of economic turbulence. Farshadfar et al. (2008) developed univariate regression models to compare traditional measures of cash flows against actual reported operating cash flows for one-year ahead operating cash flows prediction models and concluded that actual operating cash flows were superior to estimated operating cash flows.

Other prior studies such as Bowen, et al. (1986), Barth et al. (2001), Chotkunakitti (2005), Finger (1994), Habib (2010), Kim and Kross (2005), Krishnan and Largay (2000), Stammerjohan and Nassiripour (2001) have developed multiple regression models using several predictors to examine the predictive abilities of several past years of accounting and cash flows information for more than one year-ahead prediction horizon. For example, Habib (2010) compared the predictive ability of operating cash flows against earnings by using past one, two and three years of accounting information to predict up to three years-ahead operating cash flows for a cross section of Australian companies and concluded that operating cash flows were superior to earnings for all the years.

When developing prediction models, some prior studies assumed that sales followed the random walk model, implying that current period cash flows persist into the current and future periods (Barth et al. 2001; Dechow et al. 1998; Quirin et al. 1999; Yoder 2006). For example, current working capital accruals, such as accounts receivable and accounts payable, are assumed received or paid in the following period (Yoder 2006). Elements of future operating cash are flows are expected to be present within accruals, which in turn are embedded in earnings. Consequently, earnings are expected to be superior predictor of future operating cash flows than current operating cash flows due to the presence of accruals within earnings (Dechow et al. 1998). Under the random walk assumption, past earnings can be assumed as surrogates for future earnings (Brown 1993; Yang 2000).
2.5.2 Comparative abilities of earnings, accruals and operating cash flows in predicting future operating cash flows

The previous section 2.5.1 examined the first main research theme on the comparative studies of the abilities of earnings versus operating cash flows for future operating cash flows prediction. This section 2.5.2 examines the second major research theme on the comparative studies of the abilities of earnings, accruals and operating cash flows for future operating cash flows prediction. These studies have reported that earnings, accruals and operating cash flows are relevant in predicting future operating cash flows but the comparative predictive abilities are contradictory.

Earnings comprised of a combination of accruals and operating cash flows (Chotkunakitti 2005; Dechow 1994; Dechow and Dichev 2002; Dechow et al. 2008). Accruals is a consequence of reporting the financial transaction in the same reporting period when it occurs, irrespective of the cash flow timing, which was explained in section 2.4.1. It is deferred cash payments or cash receipts and the future working capital investment decisions by management (Barth et al. 2001). Prior studies mainly investigated the incremental predictive ability of accruals by combining accruals with operating cash flows and compared the combined model with operating cash flows and earnings in predicting future operating cash flows (Al-Attar and Hussain 2004; Barth et al. 2001; Chotkunakitti 2005; Dechow et al. 1998; Ebaid 2011; Hollister et al. 2008; Yoder 2006). These prior studies mainly developed a combination of univariate and multiple linear regression models as proxies for the prediction models and mainly used the adjusted R² to compare the explanatory powers of the models in explaining future operating cash flows variations (Al-Attar and Husain 2004; Barth et al. 2001; Chotkunakitti 2005; Dechow et al. 1998; Ebaid 2011; Hollister et al. 2008; Yoder 2006). The findings from these empirical studies are conflicting and inconclusive.

Some empirical studies have documented that operating cash flows combined with aggregated accruals model is superior to both the earnings and operating cash flows models in predicting future operating cash flows (Al-Attar and Hussain 2004; Barth et al. 2001; Ebaid 2011). Furthermore, disaggregating the accruals into the major accrual
components (such as accounts receivable changes, accounts payable changes, inventory changes and depreciation expense) and combine with operating cash flows appeared to improve further the predictive ability of disaggregated earnings. Empirical evidence indicates that the ability of the combined operating cash flows with disaggregated accrual components model has the most superior ability compared to operating cash flows-only, earnings-only and operating cash flows combined with aggregated accruals models in predicting future operating cash flows (Al-Attar and Hussain 2004; Barth et al. 2001; Ebaid 2011). These empirical studies concluded that disaggregating earnings into the operating cash flows and aggregated accruals components of earnings enhance the predictive ability of earnings for future operating cash flows and disaggregating the accruals into the individual components further strengthen the predictive powers of disaggregated earnings (Al-Attar and Hussain 2004; Barth et al. 2001; Ebaid 2011).

An explanation for this phenomenon is that each of the accruals components embedded in earnings has a different effect on future operating cash flows (Barth et al. 2001; Dechow et al. 1989; Ebaid 2011), with long term accruals, such as depreciation relating to long term assets, having greater impact (Barth et al. 2001). Aggregated earnings implicitly placed the same degree of emphasis to each accruals component, thus masking the effects of each component that are relevant to future operating cash flows. Disaggregating the aggregated earnings and further disaggregating the accruals into the individual components unmask the distinctive impact of each accrual component and hence, enhance the predictive ability for future operating cash flows prediction (Barth et al. 2001; Ebaid 2011). Nevertheless, the incremental gains in the explanatory power from disaggregating earnings are expected to reduce when the prediction horizon increases (Al-Attar and Hussain 2004; Hollister et a. 2008). The degree and quality of accruals can also affect the persistence of current earnings into the future operating cash flows (Al-Attar, Hussain and Zuo 2008; Subramanyam 1996).

Other prior research has also provided conflicting evidence that operating cash flows-only as a single predictor is superior to both earnings-only and operating cash flows combined with aggregated/disaggregated accrual components models in predicting future
operating cash flows (Chotkunakitti 2005). Furthermore, some prior studies documented no discernible difference between the ability of cash flows combined with accruals model and operating cash flows-only model in predicting future operating cash flows (Stammerjohan and Nassiripour 2001; Supriyadi 1998). Empirical research has also documented that disaggregating the operating cash flows into the individual cash flows components and combine with accruals are superior to operating cash flows-only as a single predictor of future operating cash flows (Arthur and Chuang 2006; Cheng and Hollie 2008). Furthermore, the predictive ability of accruals for one-year ahead future operating cash flows is also dependent on the country’s accounting rule and legal systems such that long term accruals (such as depreciation) based on code-law regimes has stronger predictive ability for future cash flows than those based on common-law regimes (Hollister et al. 2008).

The next sections 2.5.2.1 and 2.5.2.2 elaborate further on these studies. Research conducted in the developed countries, which have larger economies and more mature capital markets, are examined in section 2.5.2.1. Prior studies conducted in developing countries that have smaller economies with emerging capital markets are reviewed in section 2.5.2.2.

2.5.2.1 Research conducted in developed countries with large economies and mature capital markets

This section examines prior studies conducted in the developed countries, which have larger economies and mature capital markets. These studies were mainly conducted in the United States, United Kingdom and Australia and have reported conflicting findings on the relative abilities of earnings, accruals and operating cash flows for future operating cash flows prediction.

Dechow et al. (1998) developed multiple regression models comprising of past earnings, operating cash flows and accrual components to examine the ability of earnings versus cash flows in forecasting future operating cash flows for listed firms in the United States for the period from 1963 to 1992. They assumed that earnings are a constant proportion
of sales, which follows a random walk. The accounts receivable is assumed proportionate to changes in current sales and accounts payable is proportionate to changes in current purchases. Purchases are assumed to vary in accordance to the inventory level in the relevant period and also dependent on the following period sales expectations. Dechow et al. developed a prediction model that expressed current operating cash flows (proxy for future operating cash flows) as a function of earnings, cash receipts from current sales that are uncollected (accounts receivable), cash payments from current outstanding purchases (accounts payable) and the inventory level as a constant proportion of current sales and expected future sales. They examined and concluded that current earnings are superior to operating cash flows in predicting future operating cash flows. However, Dechow et al. did not consider the effect of current sales shocks impacting current and future accruals and these changes in accruals can affect cash flows in the current and subsequent periods. This limitation was later examined by Barth et al. (2001).

Barth et al. (2001) extended the study by Dechow et al. (1998) by developing multiple linear regression models to examine the relative explanatory powers of earnings, accruals and operating cash flows of a cross section of listed companies in the United States for one year ahead and subsequent periodic cash flows. They used annual financial accounting information for a period of 10 years from 1987 to 1996 and scaled the data using average total assets to eliminate size and heteroskedasticity effects. Barth et al. developed prediction models that expressed current operating cash flows (as proxy for future operating cash flows) as a function of a constant proportion of sales (earnings), accruals and operating cash flows. They concluded that operating cash flows were superior to earnings in predicting future operating cash flows, which contradicted the findings by Dechow et al. (1998). Additionally, Barth et al. examined the incremental explanatory ability of accruals by combining aggregated accruals with operating cash flows and revealed that the combined model was superior to the cash flows-only model or earnings-only model in predicting future operating cash flows. They have also disaggregated accruals into the six major accruals components (accounts receivable changes, accounts payable changes, inventory, other accruals, depreciation and amortisation expenses) and examined their predictive abilities by combining them with
operating cash flows. The operating cash flows combined with disaggregated accrual components model was revealed to have the strongest predictive abilities, followed by the operating cash flows combined with aggregated accruals model and the operating cash flows model. The least predictive is the earnings model. Disaggregating the accruals into the major accruals components is concluded to strengthen further the model’s predictive ability. Earnings were also reported by Barth et al. to have the ability to predict future operating cash flows up to three years ahead, while operating cash flows combined with disaggregated major accrual components were reported to have the strongest predictive ability for four years ahead compared to earnings-only or cash flows-only as a single predictor of future operating cash flows.

Some researchers have included additional accruals components to the prediction model initially developed by Barth et al. (2001). Stammerjohan and Nassiripour (2001) developed multiple regression models to evaluate the predictive ability of earnings, accruals and operating cash flows of a cross section of companies in the United States for a period of 10 years from 1988 to 1997. They divided the sample into two subcategories; the within sample, which was used to develop the regression models and the holdout sample, which was used to validate the robustness of the regression models. Additional to the six major accruals components initially examined by Barth et al. (2001), they have included two extra accruals components, which are changes in tax payable and deferred tax. Consistent with Barth et al. (2001), they have reported that current operating cash flows combined with accruals have stronger predictive powers than earnings-only as a single predictor for future operating cash flows. However, the findings were inconclusive on whether the combined model has better predictive powers than the operating cash flows-only model.

Yoder (2006) examined a cross section of companies in the United States for a period of 16 years from 1989 and 2004. They included sales growth and inventory as two additional predictors to the model initially developed by Barth et al. (2001). Yoder examined and concluded that these additional components improved the predictive ability of the model such that the combined model is superior to operating cash flows-only and
operating cash flows combined with aggregated accrual in predicting future operating cash flows. The predictive abilities of the predictors were documented by Yoder to vary across different industries.

Al-Attar and Hussain (2004) adopted the model developed by Barth et al. (2001) to examine the relative predictive abilities of earnings, accruals and operating cash flows for future operating cash flows of listed firms in the United Kingdom. The models were developed to predict operating cash flows for one to three years-ahead horizon. Data of these firms, which were listed on the London Stock Exchange, was collected for a period 10 years from 1991 to 2000 and deflated by the number of shares. They did not require all firms to have data available throughout the period examined to avoid survivorship biasness. Operating cash flows were reported to be superior to earnings in predicting future operating cash flows by them. However, the accruals combined with operating cash flows model were superior to both the aggregated earnings-only and operating cash flows-only models for up to three years prediction horizon. Additionally, disaggregating accruals into the individual accrual components and combined with operating cash flows further improved the predictive powers and exceed that of earnings and operating cash flows (Al-Attar and Hussain 2004). Their findings are consistent with Barth et al. (2001).

Some studies have examined the incremental predictive abilities of disaggregated operating cash flow components (Arthur and Chuang 2006; Cheng and Hollie 2007). Operating cash flows can be disaggregated into core and non-core components. Core cash flows are those related closely to operations, such as sales, cost of goods sold and operating expenses while non-core cash flows are those related to non-operating cash flows such as interest, taxes and other expenses (Arthur and Chuang 2006; Cheng and Hollie 2007). Empirical studies have documented that the ability of the disaggregated cash flow components combined with accrual components model is superior to aggregated cash flows combined with accrual components model in predicting future operating cash flows (Arthur and Chuang 2006; Cheng and Hollie 2008). Thus, disaggregating the operating cash flows into the individual operating cash flows components enhances the predictive ability for future operating cash flows (Arthur and
A possible explanation is that disaggregating cash flows into the individual components of cash flows unmasked the different contributions of each cash component within the aggregated operating cash flows (Arthur and Chuang 2006). These findings are consistent with similar capital market studies, which have revealed that investors distinguished the components of operating cash flows and incorporated these differences in the share price (Clinch et al. 2002; Dechow et al. 2008).

Controlling for accruals and the length of the firm’s operating cycle, Arthur and Chuang (2006) investigated and documented that disaggregated cash flow components were superior in predicting future operating cash flows compared to aggregated operating cash flows for Australian companies. Operating cash flows are also indicated as superior to both investing and financing cash flows in predicting future operating cash flows and disaggregated operating cash flows combined with disaggregated accrual components is superior to aggregated operating cash flows in predicting future operating cash flows (Arthur and Chuang 2006).

Core operating cash flow components for firms in the United States were reported by Cheng and Hollie (2007) as superior to non-core cash flow components in predicting future operating cash flows, which is consistent with Arthur and Chuang (2006). The entire core operating cash flow components shared similar persistency into future operating cash flows but for non-core cash flows, taxes has the least persistence compared to interest or other expenses (Cheng and Hollie 2007). Furthermore, combining the operating cash flow components with accruals strengthens the future operating cash flows predictive ability for firms with high cash flow or earnings variability, especially for large size firms (Cheng and Hollie 2007).

This section examined comparative operating cash flows prediction studies conducted in the developed countries that have large economies with mature capital markets. The next section examines prior research conducted in developing countries that have smaller economies and emerging capital markets.
2.5.2.2 Research conducted in developing countries with smaller economies and emerging capital markets

This section examines prior studies that have investigated the comparative abilities of accounting information and operating cash flows in predicting future operating cash flows in developing countries that have smaller economies and emerging capital markets. These studies, which were mainly conducted in Indonesia (Supriyadi 1998), Thailand (Chotkunakitti 2005) and Egypt (Ebaid 2011), have also reported contradictory findings.

Supriyadi (1998) investigated the predictive ability of earnings, cash flow from operations, revenue and current accruals of a cross section of Indonesian listed firms using multiple linear regression models. Semi-annual financial data of listed Indonesian companies was collected for a period of 8 years from 1990 to 1997. The sample was subdivided into two parts, the within sample (1990 to 1996) was used to develop the regression models and the holdout sample (1997) was used to validate the models. Supriyadi developed prediction models that expressed current operating cash flows (as proxy for future operating cash flows) as a function of operating cash flows, earnings, revenue and current accruals for one and two years of prediction horizon. Supriyadi reported that operating cash flows is superior to earnings while operating cash flows combined with earnings is superior to both operating cash flows and earnings as a single predictor. Supriyadi also concluded that combining current accruals, revenue and earnings with operating cash flows did not enhance the predictive ability of the model. These findings conflicted with the findings by Barth et al. (2001).

Extending the study by Barth et al. (2001), Chotkunakitti (2005) compared the ability of earnings, accruals and operating cash flows in predicting the future operating cash flows of a cross section of Thai listed companies. The accounting data were collected from published annual financial statements for a period of 14 years from 1994 to 2002 for Thai listed companies. Similar with Stammerjohan and Nassiripour (2001) and Supriyadi (1998), the sample was partitioned into two sub-categories; the within sample to develop the regression models and the holdout sample to evaluate the validity and robustness of the regression models. Consistent with Barth et al. (2001), operating cash flows as a
single predictor was reported as superior to earnings in predicting future operating cash flows (Chotkunakitti 2005). However, conflicting with Barth et al. (2001) and Stammerjohan and Nassiripour (2001), operating cash flows were concluded as superior to operating cash flows combined with aggregated/disaggregated accruals in predicting future operating cash flows (Chotkunakitti 2005). However, the findings from this study may be biased as the sample data was not deflated to remove the effects of size and heteroskedasticity, unlike Barth et al. (2001) and other prior studies.

A recent study by Ebaid (2011) extended Barth et al. (2001)’s study by investigating the comparative ability of accrual-based accounting information and operating cash flows in predicting one-year ahead operating cash flows for a cross section of companies listed on the Egyptian stock exchange for a period of 8 years from 1999 and 2007. Ebaid developed multiple linear regression models using only past one year of earnings, operating cash flows, aggregated accruals and disaggregated accrual components as predictors and scaled by average total assets. He concluded that the ability of earnings were superior to operating cash flows when predicting one year-ahead operating cash flows. When operating cash flows were combined with the aggregated accruals, the combined model was superior to both earnings-only and operating cash flows-only models in predicting one year ahead operating cash flows. The predictive ability was enhanced further when accruals were disaggregated into the major accruals components and combined with operating cash flows. Ebaid concluded that disaggregating earnings into the operating cash flows and aggregated accruals components of earnings and further disaggregating the accruals into the individual components enhances the predictive ability of earnings for one year-ahead operating cash flows. These findings were consistent with Al-Attar and Hussain (2004) and Barth et al. (2001). However, this study was confined to examining only one year-ahead prediction horizon and did not investigate the effects of more than one year past earnings, accruals and operating cash flows on current operating cash flows. Other prior research has indicated that past earnings, accruals and operating cash flows can influence future operating cash flows, at least up to three years (such as Al-Attar and Hussain 2004; Barth et al. 2001; Chotkunakitti 2005; Hollister et al. 2008).
In summary, numerous prior studies have examined the comparative abilities of earnings, accruals and operating cash flows for future operating cash flows prediction in many countries and different settings but the findings remain contradictory. Some studies have also compared the predictive abilities of operating cash flows combined with accruals, operating cash flows-only and earnings-only as a single predictor of future operating cash flows with conflicting findings. These prior studies were mainly conducted in the developed countries that have large economies and mature capital market. Only a few studies were conducted in developing countries with smaller economies and emerging capital markets. There are limited studies in the Malaysian context that provided direct empirical evidence on the extent earnings, accruals and operating cash flows information are able to predict future operating cash flows. The key findings from these comparative studies on earnings, accruals and operating cash flows in predicting future operating cash flows are summarised in table 2.3.
Table 2.3 Summary of prior studies on the comparative abilities of earnings, accruals and operating cash flows in predicting future operating cash flows

<table>
<thead>
<tr>
<th>Authors and year of publication</th>
<th>Sample</th>
<th>Method &amp; Variables</th>
<th>Results summary</th>
</tr>
</thead>
</table>
| Supriyadi (1998) | Indonesia. Semi-annual data. 1990-1997 (8 years). Two sample: within sample (1990 to 1996) to develop the models; holdout sample (year 1997) used validate sample. | MLR. Mean average prediction errors, earnings, CFO, revenues and current accruals. | i. CFO superior to earnings in predicting up to two years-ahead CFO.  
ii. CFO combined with earnings model superior to earnings-only model, operating cash flows-only model and operating cash flows combined with various accounting information (earnings, revenues and current accruals) model.  
iii. Including accruals and revenues did not improve the predictive abilities of the model. |

Source: Summarised from extant literature.
Table 2.3 Summary of prior studies on the comparative abilities of earnings, accruals and operating cash flows in predicting future operating cash flows (continue)

<table>
<thead>
<tr>
<th>Authors and year of publication</th>
<th>Sample</th>
<th>Method &amp; Variables</th>
<th>Results summary</th>
</tr>
</thead>
</table>
ii. Disaggregating earnings into CFO and accrual components strengthen the predictive ability of earnings for future CFO.  
iii. CFO combined with aggregated accruals is superior to aggregated earnings and operating cash flows in predicting future operating cash flows.  
iv. Accruals can be disaggregated into six major components; accounts receivable changes ($\Delta$AR), accounts payable changes ($\Delta$AP), inventory changes ($\Delta$INV), depreciation (DEPR), amortisation (AMORT) and other accruals (OTHER).  
v. CFO combined with these major accrual components is superior to both aggregated earnings and CFO in predicting future CFO.  
vi. Expected future CFO can be expressed as a) a function of several lags of earnings or b) as a function of operating cash flows and major accrual components.  
vii. Up to three years lag of aggregated earnings and up to four years lag of CFO combined with accruals have explanatory ability to predict future CFO. |

Source: Summarised from extant literature.
Table 2.3 Summary of prior studies on the comparative abilities of earnings, accruals and operating cash flows in predicting future operating cash flows (continue)

<table>
<thead>
<tr>
<th>Authors and year of publication</th>
<th>Sample</th>
<th>Method &amp; Variables</th>
<th>Results summary</th>
</tr>
</thead>
</table>
| Stammerjohan and Nassiripour (2001) | United States. 1988-1997 (10 years). Pooled sample has 944 firms, cross sectional sample has between 1,887 and 3,603 firms. Within sample to develop the models; holdout sample to validate the model. | MLR. Earnings, CFO, aggregated accruals, accrual components ($\Delta AR, \Delta AP, \Delta INV, DEPR, AMORT, OTHER, \Delta Tax payable, \Delta Deferred Tax,$). | i. CFO is superior to earnings in predicting future CFO.  
ii. CFO combined with aggregated accruals as predictors of future CFO is superior to earnings but inconclusive compared to CFO. |

ii. Disaggregating earnings into the operating cash flows and accrual components enhances the predictive ability of earnings.  
iii. Accruals combined with CFO is superior to CFO and earnings in predicting up to three years ahead CFO. |

Source: Summarised from extant literature.
Table 2.3 Summary of prior studies on the comparative abilities of earnings, accruals and operating cash flows in predicting future operating cash flows (continue)

<table>
<thead>
<tr>
<th>Authors and year of publication</th>
<th>Sample</th>
<th>Method &amp; Variables</th>
<th>Results summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chotkunakitti (2005)</td>
<td>Thailand. 1994-2002 (9 years). Listed firms on the Thai Stock Exchange. 1,970 firm years (exclude financial services). Holdout sample (year 2002) used to validate models.</td>
<td>Univariate, MLR and mean average prediction errors. Earnings, CFO, aggregated accruals, accruals components ($\Delta AR$, $\Delta AP$, $\Delta INV$, DEPR, AMORT, OTHER).</td>
<td>i. Earnings, CFO, CFO combined with aggregated/disaggregated accrual components are significant in predicting future CFO.  ii. CFO is superior to earnings and CFO combined with aggregated/disaggregated accrual components up to three years in predicting future operating cash flows.  iii. Earnings have the least predictive powers.</td>
</tr>
<tr>
<td>Arthur and Chuang (2006)</td>
<td>Australia 2000-2004 (5 years) 163 firms. 13,224 firm years (excludes financial services) At least 3 years of data.</td>
<td>MLR. CFO, cash flow components, accrual components ($\Delta AR$, $\Delta AP$, $\Delta INV$, DEPR, AMORT, OTHER).</td>
<td>i. Cash flow components comprised of cash receipt from customer, cash payments to suppliers, dividends received, interest received and interest paid.  ii. Operating cash flows is superior to investment and financing cash flows in predicting future operating cash flows.  iii. Dividends received and interests paid are poor predictors of future CFO.  iv. Cash receipt from customer and cash payments to suppliers are significant in explaining future operating cash flows.</td>
</tr>
</tbody>
</table>

Source: Summarised from extant literature.
Table 2.3 Summary of prior studies on the comparative abilities of earnings, accruals and operating cash flows in predicting future operating cash flows (continue)

<table>
<thead>
<tr>
<th>Authors and year of publication</th>
<th>Sample</th>
<th>Method &amp; Variables</th>
<th>Results summary</th>
</tr>
</thead>
</table>
| Arthur and Chuang (2006) (continue) | United States. 1989-2004 (16 years). Manufacturing, wholesale and retail industries. Excludes financial services firms. 25,487 firm years. | MLR. CFO, accrual components (ΔAR, ΔAP, ΔINV, ΔAccExp, ΔAccIT), actual current sales (S), future sales growth (EΔSales2) and inventory (proxy for management forecasts of future sales). | v. Cash flow components model is superior to the aggregated CFO model in predicting future operating cash flows. Thus, disaggregating CFO into the individual components of cash flows improves the predictive ability of operating cash flows for future operating cash flows.  
vi. Disaggregated accruals combined with disaggregated CFO enhance the predictive power of the model. The combined model is superior to aggregated CFO model. |

Source: Summarised from extant literature.
Table 2.3 Summary of prior studies on the comparative abilities of earnings, accruals and operating cash flows in predicting future operating cash flows (continue)

<table>
<thead>
<tr>
<th>Authors and year of publication</th>
<th>Sample</th>
<th>Method &amp; Variables</th>
<th>Results summary</th>
</tr>
</thead>
</table>
| Cheng and Hollie (2008)         | United States. 1988-2004 (16 years). Excludes financial services firms. 29,090 firm years. | MLR. CFO, cash flows components (core and non-core) and accruals components (ΔAR, ΔAP, ΔINV, DEPR, AMORT, OTHER). | i. Core cash components are the operating items in the income statement closely related to operating activities (sales, cost of goods sold and operating and administrative expenses).  
ii. Non-core cash components are non-operating items in the income statement (interest, taxes and other expenses).  
iii. Disaggregating operating cash flows into core and non-core cash flow components increases the ability to predict future CFO, especially for firms with high cash flows and earnings variability.  
iv. Core cash flow components are superior to non-core cash flow components in predicting future CFO.  
v. Among the non-core cash flow components, taxes are the least persistence than interest or other expenses.  
vi. Cash flow components combined with accruals components is superior to aggregated CFO-only and to aggregated CFO combined with accruals components in predicting future CFO. |

Source: Summarised from extant literature.
Table 2.3 Summary of prior studies on the comparative abilities of earnings, accruals and operating cash flows in predicting future operating cash flows (continue)

<table>
<thead>
<tr>
<th>Authors and year of publication</th>
<th>Sample</th>
<th>Method &amp; Variables</th>
<th>Results summary</th>
</tr>
</thead>
</table>
| Hollister, Shoaf and Tully (2008) | 34,069 firm years for several countries. | MLR. CFO, accruals components (ΔAR, ΔAP, ΔINV, DEPR, AMORT, OTHER). | i. Disaggregating earnings into CFO and major accrual components significantly increases future operating cash flows prediction.  
ii. Disaggregated accrual components combined with CFO is superior to CFO in predicting one year-ahead CFO.  
iii. Predictive ability of accruals depends on the country’s accounting rule and legal system.  
iv. Non-current accruals (such as depreciation) based on code-law regimes is superior to common-law regimes in predicting one year-ahead CFO. |
| Ebaid (2011) | Egypt. 1999-2007 (9 years) 74 firms. Companies listed on the Egyptian stock exchange. | Univariate, MLR and Vuong test. Earnings, CFO, aggregated accruals, accrual components (ΔAR, ΔAP, ΔINV, DEPR, OTHER) | i. Earnings have superior predictive ability compared to CFO for one-year ahead CFO.  
ii. Disaggregating earnings into CFO and accrual components strengthen the predictive ability of earnings for future CFO.  
iii. CFO combined with aggregated accruals is superior to aggregated earnings and operating cash flows in predicting future operating cash flows.  
iv. CFO combined with major accrual components is superior to both aggregated earnings and CFO in predicting one year-ahead CFO. |

Source: Developed by the author from extant literature.
2.6 Other related studies

The previous section 2.5 examined the comparative abilities of accounting and operating cash flows for future operating cash flows prediction. This section examines other studies related to the main research area. These are mainly prior studies that have compared the ability of accounting and operating cash flows in explaining capital market returns and other related studies within the Malaysian context.

Capital market studies comparing the abilities of accounting and operating cash flows information in explaining share market returns are examined in section 2.6.1. The relevance of EBITDA as an alternative performance measurement for valuation purposes are discussed in section 2.6.2. Prior studies on the relevance of accounting and cash flows information in explaining share market returns and in predicting financial distress within the Malaysian context are reviewed in section 2.6.3. The limitations in using share prices for prediction studies are discussed in section 2.6.4.

2.6.1 Comparative abilities of accounting and operating cash flows information in explaining stock market returns

Prior empirical studies have investigated the usefulness of accounting information to equity investors. Accounting information is deemed value relevant if there is a statistical correlation between share market values and accounting information (Beisland 2009). Ever since Ball and Brown (1968) pioneered capital market studies on the value relevance of accounting information in explaining share market returns, various researchers have examined the comparative abilities of earnings, accruals and operating cash flows information in explaining equity market values with contradictory results (such as Bartov, Goldberg and Kim 2001; Bowen, Burgstahler and Daly 1987; Cotter 1996; Dechow 1994; Dechow and Ge 2006; Fairfield, Whisnant and Yohn 2003a; Pourheydari and Ahmadi 2008; Sloan 1996). These comparative studies are categorised into two main themes and reviewed in this section. The first main research theme relates to comparative studies on the abilities of earnings and operating cash flows in explaining share market returns and is reviewed in section 2.6.1.1. The second main research theme
relates to comparative studies on abilities of earnings, accruals and operating cash flows in explaining share market returns, which is reviewed in section 2.6.1.2.

2.6.1.1 Comparative abilities of earnings and operating cash flows in explaining stock market returns

Empirical studies have documented that both earnings and operating cash flows are value relevant in explaining stock market returns (such as Dechow 1994; Haw, Qi and Wu 2001; Hodgson and Clarke 2000; Penham and Yehuda 2009; Pourheydari and Ahmadi 2008). These studies have mostly reported that earnings are superior to operating cash flows in explaining unexpected share market returns and changes in earnings are more highly associated with unexpected share market changes than operating cash flows variations (such as Ali 1994; Dechow 1994; Guay and Sidhu 2001; Haw et al. 2001; Penman and Yehuda 2009; Subramanyam and Venkatachalam 2001).

Nevertheless, a few prior studies indicated no significant difference between earnings and operating cash flows in explaining market returns (Cheng, Liu and Schaefer 1997a and 1997b; Plenborg 1999). Operating cash flows were also reported to have stronger explanatory powers than earnings in explaining security returns (Hogson and Clarke 2000) while a more recent study by Penman and Yehuda (2009) provided conflicting evidence that operating cash flows has no significant explanatory powers for equity market returns.

Capital market studies that have compared the abilities of earnings versus operating cash flows in explaining share market returns are summarised in table 2.4.
Table 2.4 Summary of prior studies on the comparative abilities of earnings and operating cash flows in explaining stock market returns

<table>
<thead>
<tr>
<th>Earnings is superior</th>
<th>Operating cash flows is superior</th>
<th>No discernible difference</th>
</tr>
</thead>
</table>

Source: Developed from prior studies.
2.6.1.2 Comparative abilities of earnings, accruals and operating cash flows in explaining stock market returns

The previous section examined the first main research theme on the comparative abilities of earnings and operating cash flows in explaining share market returns. This section examines the second main research theme on the comparative abilities of earnings, accruals and operating cash flows in explaining share market returns. These prior studies have also reported conflicting findings.

Prior studies have documented that earnings, accruals and operating cash flows are value relevant but their comparative abilities of in explaining share market returns are contradictory (Bernand and Stober 1989; Charitou and Ketz 1990; Cotter 1996; Green 1999; Guay, Kothari and Watts 1996; McLeay, Kassab and Helan 1997; Rayburn 1986). Some studies reported that the explanatory powers of disaggregated accrual components on share market returns are superior to operating cash flows (Guay et al. 1996; Subramanyam 1996) and aggregated earnings (Chia, Czernkowski and Loftus 1997) while other research has documented that operating cash flows are superior to accruals in predicting future share prices, operating cash flows and earnings (Pourheydari and Ahmadi 2008).

Some of these studies have evaluated the association between accruals, earnings and operating cash flows with share returns using accounting-based or share-based firm valuation models (Francis, Olsson and Oswald 2000; Guay et al. 1996; Pae 2005; Penman and Sougiannis 1998; Pourheydari and Ahmadi 2008; Subramanyam 1996). The models adapted are mainly those developed by Easton, Harris and Ohlson (1992), Ohlson (1995 and 1999) and Jones (1991).

The model developed by Jones (1991) disaggregated total accruals into discretionary and non-discretionary accruals. Discretionary accruals are those accruals decided by management, such as provisions for potential bad debts, while non-discretionary accruals relates to expenses that are payable but has not occurred, such as utilities expenses (Ayers, Jiang and Yeung 2006). Some prior studies adopted the Jones model to
disaggregate accruals into discretionary and non-discretionary accruals and examined their association with earnings, operating cash flows and share market returns by regressing these disaggregated accrual components and operating cash flows with share market returns (Guay et al. 1996; Pae 2005; Subramanyam 1996). These studies have reported that discretionary or unexpected accruals are positively associated with share market returns and share prices incorporate these accruals in their pricing (Guay et al. 1996; Pae 2005; Subramanyam 1996).

The Ohlson model relates the equity value to the book value and earnings (Easton et al. 1992; Ohlson 1995; Ohlson 1999). Using the Ohlson model to compare the predictive abilities of earnings and operating cash flows, some studies documented that earnings are superior to dividends or operating cash flows in explaining stock returns (Cotter 1996; Francis et al. 2000; Penman and Sougiannis 1998). The explanatory abilities of non-current and non-operating accruals are also revealed to increase with longer periods (Cotter 1996).

A more recent study by Pourheydari and Ahmadi (2008) adapted the revised market valuation framework developed by Ohlson (1999) to examine the association between accruals and operating cash flow components of earnings with equity market value (proxy for firm value), future operating cash flows and future earnings for Iranian companies listed on the Theran Stock Exchange during the period 2000 to 2004. Operating cash flows are documented to have stronger ability than accruals in predicting future earnings, future operating cash flows and equity market value, while accruals do not have incremental explanatory power for future earnings and equity market value for Iranian firms (Pourheydari and Ahmadi 2008).

The association between the accruals and stock market returns is also found to be negative (Sloan 1996). Accruals reverse more rapidly than operating cash flows and that the higher (lower) the accrual components in current earnings, the lower (higher) the stock market returns (Sloan 1996). Capital market investors do take consideration of the amount of discretionary and non-discretionary in accruals when estimating the value of
the firm (Guay et al. 1996; Pae 2005; Subramanyam 1996). Those accruals that require management estimations, such as depreciation and provisions for contingent liabilities, are known as discretionary accruals while obligatory expenses that has not been realised but recorded in the accounts (such as electricity payable), are non-discretionary accruals (Ayers et al. 2006).

Persistency means the degree in which the current period components transpire again in the future periods (Francis and Smith 2005, p.414). Some prior studies have also reported that when earnings are disaggregated into the accruals and cash flow components, the accrual components are documented to be less persistent into future earnings compared to the cash flow components (Dechow and Dichev 2002; Dechow and Ge 2006; Dechow et al. 2008; Fairfield, Whisement and Yohn 2003b; Richardson et al. 2005; Sloan 1996; Xie 2001). The lower persistence of accruals in future periods may be due to the poor reliability aspect of accruals resulting from estimation errors (Dechow and Dichev 2002; Richardson et al. 2005) or intentional opportunistic manipulations (Richardson et al. 2006; Sloan 1996; Xie 2001). Discretionary accruals are more subjective to manipulations due to the exposure to opportunistic earnings management. If there are earnings manipulations in a particular year, these accruals reverse in the following year, thus rendering them less persistent compared to the cash components of earnings into future earnings (Sloan 1996; Xie 2001). However, some studies have also argued that the lower accruals persistency is not due to earnings management or manipulations, but instead associated with economic growth factors, such as diminishing marginal returns from increasing level of investments rather than accounting distortions (Anderson and Garcia-Feijoo 2006; Cooper, Gulen and Schill 2005; Fairfield et al. 2003b; Khan 2005; Titman, Wei and Xie 2004; Zach 2005). Firms with high institutional investors were also indicated to significantly reduce accruals mispricing (Collins, Gong and Hribar 2003).

Prior studies have documented that earnings, accruals and operating cash flows are value relevant in explaining share market returns. These studies were mainly conducted in other countries, which may not be easily generalisable to Malaysia due to differences in the capital market characteristics, earnings volatility and business environment. Empirical
research has also shown that capital market investors do distinguish accruals and operating cash flows when anticipating future earnings and estimating share value. However, extant literature on the comparative value relevance of earnings, accruals and operating cash flows is contentious.

The next section examines extant literature on accrual-based EBITDA accounting information as an alternative performance measurement for valuation purposes.

2.6.2 EBITDA as an alternative performance measurement for valuation purposes

Capital market investors often focus on earnings before interest, tax, depreciation and amortisation expense (EBITDA) as an alternative performance measurement in addition to earnings or cash flows (Berk et al. 2009; Berk et al. 2011; Misund et al. 2005). It is easily computed by adding back interest, tax, depreciation and amortisation expense to net income. This accrual-based accounting information reflects the operating efficiency of the company and excludes the effects from the gearing level. This makes it more reflective of the underlying core business of the company and more reliable than sales or earnings when forecasting future operating cash flows to estimate the value of the firm (Berk et al. 2009; Berk et al. 2011). Consequently financial analysts often use EBITDA as proxy for operating cash flows when forecasting the firm’s value (Berk et al. 2009; Berk et al. 2011; Misund et al. 2005). Lenders and bankers also often use EBITDA to assess the ability of the firm to repay loans in the future since it represents recurring income that are used to repay financial obligations of the business (Berk et al. 2009).

Empirical research has documented that EBITDA information has value relevance with respect to share prices (Florou and Chalevas 2010; Misund et al. 2005). Misund et al. (2005) have investigated and concluded that EBITDA are value relevant in explaining share returns for the petroleum industry and investors have more confidence on EBITDA’s reliability than earnings when valuing the firm. A recent study by Florou and Chalevas (2010) used various accounting ratios (such as return on assets, current ratio, asset turnover ratio and EBITDA margin) to identify the value drivers (such as operating management, investment management and financial management) that affect capital
market returns for listed firms in Greece. The EBITDA margin, which is computed as EBITDA divided by sales and represents the operating performance of the company, was documented as a key value driver affecting share price (Florou and Chalevas 2010).

Financial analysts and investors emphasise the importance of EBITDA as a performance measurement and often use EBITDA as a valuation construct. However, empirical evidence directly confirming the ability of EBITDA and the relative powers to other accounting information in predicting future operating cash flows is lacking within the Malaysian context.

2.6.3 Related prior studies within the Malaysian context
The previous section 2.6.2 examined extant literature on EBITDA role as an alternative performance measurement used by financial analysts and investors for valuation purposes. This section 2.6.3 briefly examines prior studies related to the main research area within the Malaysian context, which are categorised into two main themes. The first main theme, which is discussed in section 2.6.3.1, relates to prior studies that have investigated the value relevance of various accounting and cash flows information in explaining share market returns in Malaysia. The second main theme, which is discussed in section 2.6.3.2, relates to past studies that have examined the ability of reported accounting and cash flow information in predicting the financial distress of listed Malaysian firms.

2.6.3.1 Accounting and cash flows information in explaining share market returns within the Malaysian context
Recent empirical research within the Malaysian context has investigated and substantiated the value relevance of accounting and cash flow information in explaining share market returns, such as Cheng and Mohamad (2008), Kadri et al. (2009 and 2010), Pirie and Smith (2008) and Shukor et al. (2009). These studies have investigated and provided various perspectives on how accounting information affects the share market value, which are examined in this section.
The length of period in which share prices of listed Malaysian companies incorporates earnings and cash flows announcements was investigated by Cheng and Mohamad (2008). The findings by them revealed that earnings has the ability to explain share market returns over a short, medium and annual duration period but cash flow variations has relevant information content in affecting share market returns for only a short duration of about 3 days and up to a maximum of 51 days. They concluded that earnings information is perceived to be more relevant to Malaysian capital market investors over the short, medium and long term (one year) period when valuing shares and superior to cash flows information, which is only relevant when used together with earnings during a short duration period.

Pirie and Smith (2008) investigated the association between equity book value and earnings for listed companies on Bursa Malaysia. They documented that combining earnings (derived from the income statement) and equity book value (derived from the balance sheet) as predictors have explanatory powers beyond either predictor alone in explaining Malaysian share price returns. Information reported in both income statement and balance sheet is recommended by them to be jointly used when making economic decisions.

Using Ohlson (1995)’s basic and modified equity valuation models, Kadri et al. (2010) compared the value relevance of aggregated versus disaggregated book value and earnings of high technology listed companies on Bursa Malaysia in explaining share market returns. The findings from using the basic models revealed that the explanatory powers of the book value were trending downwards while earnings were trending upwards. Using the modified models, the disaggregated book value and earnings were revealed to have superior explanatory powers compared to the aggregated book value and earnings.

Shukor et al. (2009) investigated the value relevance of intangible non-current assets reported by listed Malaysian companies in associating with share market returns (as proxy for future operating cash flows), over the period of 12 years from 1990 until 2001.
During the period studied by them, Malaysia experienced three different significant economic and accounting environmental changes. The value relevance of these intangible assets was examined for each period. The findings revealed that intangible assets have negative associations with share prices during all three periods, but only significant when the accounting regulations were more stringent. They also reported that during economic recovery and more stringent accounting regulations, intangible assets were significantly negatively associated with share valuation. These findings implicated that intangible assets are value relevant to equity investors but is controversial to them. These findings are also similar to Kadri et al. (2009), which have compared the value relevance of book value and earnings between two financial reporting requirements when it change from the MASB reporting regime to the more stringent FRS reporting regime. Kadri et al. (2009) documented that both book values and earnings are value relevant in explaining equity market values during the less stringent MASB period but only the book value was relevant during the more stringent FRS period. They concluded that introducing new or improved accounting standards enhanced significantly the value relevance of book value for equity valuation but not for earnings.

Summarising, recent empirical studies conducted within the Malaysian context have documented that accounting information and cash flows information are value relevant in explaining capital market returns. These findings are consistent with research conducted in other countries. The next section examines prior studies in Malaysia that have investigated the ability of published accounting information to predict corporate financial distress of listed Malaysian companies.

2.6.3.2 Predicting corporate distress studies in Malaysia

Related prior studies within the Malaysian context have examined the ability of reported financial information to predict corporate failure or distress for listed Malaysian companies (Abdullah et al. 2008; Low et al. 2001; Muhamad-Sori et al. 2006; Muhamad-Sori et al. 2001; Sulaiman et al. 2001). Financial distress prediction studies, which can be originally traced to Altman (1968) and Beaver (1966), have documented that financial ratios have the ability to predict corporate failure. Such prediction studies that were
conducted within the Malaysian context developed models using various statistical techniques, such as multiple discriminant analysis (MDA), logistic regression and hazard model, to investigate the ability of various financial ratios derived from financial statements in predicting the failure or distress of listed Malaysian companies. These studies concluded that various financial ratios derived from accounting and cash flows information, primarily those relating to profitability, cash flows, efficiency in asset utilisation and leverage accounting information, are able to predict corporate failure or distress for several years before the event.

Some prior studies used MDA to develop the bankruptcy prediction models and the findings implicated that ratios relating to cash flows, leverage, working capital and net worth of the company are relevant in predicting financial distress (Muhamad-Sori et al. 2001; Muhamad-Sori et al. 2006). Muhamad-Sori et al. (2001) documented that past financial ratios were able to predict corporate failure for Malaysian listed companies in the industrial sector at least four years prior to the event. Four main financial ratios were identified by Muhamad-Sori et al. (2001) as being able to discriminate between failed and non-failed firms. These ratios were total liabilities to total assets (debt ratio), sales to current asset, market value to debts and cash to current liabilities (Muhamad-Sori et al. 2001). Muhamad-Sori et al. (2006) developed prediction models using MDA to investigate the ability of financial ratios to discriminate between distressed and non-distressed firms in Malaysia, Singapore and Thailand. Debt ratio (total liabilities to total assets) was revealed to have the ability to discriminate between distress and non-distressed for Malaysian companies, current liabilities to total assets has the most superior ability for Thai companies and cash flow to assets has the strongest ability for Singaporean companies (Muhamad-Sori et al. 2006).

Logistic regression technique was used to develop prediction models to identify potentially distressed firms from a cross section of listed Malaysian companies by Low et al. (2001). Financial ratios of sales to current assets, current assets to current liabilities and percentage change in net income were indicated by them as able to predict financial distress. However, a superior indicator of corporate distress recommended by them was
the ratio of cash and marketable securities to total assets. Low et al. concluded that the cash position as an indication of cash flows provided a superior detection of financial distress.

Sulaiman et al. (2001) compared logistic and MDA techniques in developing financial distress prediction models. Their findings revealed that prediction models developed using logistic technique has stronger predictive ability compared to MDA technique. They found three main financial ratios have the ability to predict corporate distress, which were total liabilities to total assets, interest coverage and sales to total asset. These ratios relate to the leverage and asset utilisation of the company.

The abilities of MDA, logistic regression and discrete hazard model in identifying financially distressed companies were compared by Abdullah et al. (2008). The hazard model was revealed by them as the most superior in predicting corporate financial distress. The leverage ratio of debt to total assets was also reported by them as consistent across all three models in detecting financial distress. Furthermore, the MDA model revealed that net income growth was an important predictor of financial distress while both the logistic and hazard models revealed that return on assets has high predictive ability.

In summary, prior studies in Malaysia have documented that accounting and cash flows information are relevant in predicting share market returns and corporate distress. These studies have used different modelling techniques and indirectly implied that accounting and cash flows information are able to explain future operating cash flows and useful in assisting investors to make informed economic decisions. However, these studies did not provide direct empirical evidence substantiating and differentiating the ability of past accrual-based and cash-based accounting measures in predicting future operating cash flows.
2.6.4 Limitations in using share market returns as proxy for future operating cash flows

This section examines the limitations of using share market returns in prediction studies. Prior research have used the stock market returns as proxy for changes in firm value or as future operating cash flows when evaluating the value relevance of accounting and cash flows information in explaining share market returns or future operating cash flows (such as Bowen et al. 1987; Dechow 1994; Pourheydari and Ahmadi 2008; Shukor et al. 2009; Sloan 1996; Wilson 1987). However, share prices can cause biasness in the findings as it may also incorporate other information due to the inefficiency in the capital market.

The capital market is assumed to be efficient in processing information (Arthur and Chuang 2006; Yoder 2006). In reality, share prices may diverge from the fundamentals (Dechow 1994). A limitation of these studies is whether share prices reflect accurately the changes in the firm’s value as the share price reflect all kinds of information, which can distort the findings (Arthur and Chuang 2006; Ebaid 2011; Yoder 2006). Empirical research has also documented that the stock market may not incorporate fully the information content differentiation between accruals and cash flows, resulting in an accrual anomaly in the stock market (Sloan 1996; Yang 2000).

When evaluating the comparative predictive abilities of accrual-based accounting information and operating cash flows, the anomalies in the data arising from other factors can be minimised if cash flows from operating activities are used as proxy for future operating cash flows instead of market returns (Arthur and Chuang 2006; Waldron and Jordan 2010; Yoder 2006). Empirical studies have also indicated that the association between share market returns and earnings are declining (Brown, Lo and Lys 1999; Collins et al. 1997; Ely and Waymire 1999; Francis and Schipper 1999; Jones 2003; Lev and Zarowin 1999). Moreover, emerging capital markets (such as Malaysia) are substantially different from the more mature capital markets in developed countries as these emerging markets have fewer experience investors, lower efficiency in processing information, fewer number of listed companies and less regulatory requirements (Ebaid
Prediction studies using operating cash flows do not have such inherent problems or distortions compared to research using market returns.

2.7 Research Issues and Gaps

The previous sections have evaluated extant literature on the parent disciplines, the immediate disciplines and prior studies related to the research area respectively. Section 2.4 examined extant literature on the two parent disciplines, which are accrual and cash accounting principles while section 2.5 reviewed prior studies on the comparative abilities of accrual-based accounting and operating cash flows information as predictors of future operating cash flows. Section 2.6 evaluated past studies that have investigated the comparative abilities of accounting and operating cash flows information in explaining capital market returns and other related research within the Malaysian context. The numerous research gaps and issues identified from reviewing extant literature are summarised in this section.

2.7.1 Contradictory evidence on comparative predictive abilities of historical earnings versus operating cash flows

Extant literature has provided contradictory evidence on the comparative predictive abilities of earnings versus operating cash flows information for future operating cash flows. Some prior studies have reported that historical earnings are better future operating cash flows predictors than historical operating cash flows (such as Dechow et al. 1998; Ebaid 2011; Greenberg et al. 1986; Largay and Stickney 1980; Murdoch and Krause 1989 and 1990; Pae 2005; Seng 2006; Wilson 1986) while other studies have reported that historical operating cash flows have superior predictive abilities compared to historical earnings (such as Austin and Andrew 1989; Barth et al. 2001; Bowen et al. 1986; Chotkunakitti 2005; Farshadfar et al. 2008; Habib 2010; Penham and Yehuda 2009; Stammerjohan and Nassiripour 2001; Waldron and Jordan 2010). A few studies have indicated no discernible difference between the predictive abilities of earnings and operating cash flows accounting measures (Arnold et al. 1991, McBeth 1993; Pfeiffer et al. 1998).
Related studies that have compared the abilities of accounting and operating cash flows information in explaining share market returns have also provided inconsistent evidence. Most related capital market research have reported that earnings are superior to past operating cash flows information in explaining market returns (such as Charitou et al. 2001; Francis et al. 2000; Guay and Sidhu 2001; Haw et al. 2001; Penman and Sougiannis 1998; Penman and Yehuda 2009; Quirin et al. 1999; Subramanyam and Venkatachalam 2001). Nevertheless, some recent studies provided contradictory findings that historical operating cash flows information is superior to historical earnings information in explaining market returns (Hodgson and Clarke 2000; Pourheydari and Ahmadi 2008).

A limitation of these capital market studies is the reliability of using share prices. The share price may reflect other information, which may cause distortions in these studies due to the inefficiency of the capital markets in processing accounting information (Arthur and Chuang 2006; Ebaid 2011; Yoder 2006). Empirical studies have also revealed that the capital market is less efficient than expected since it failed to differentiate the information content between accruals and operating cash flows (Sloan 1996; Yang 2000). Prior studies have also documented that the association between accrual-based earnings and share market returns have been declining (Brown et al. 1999; Collins et al. 1997; Ely and Waymire 1999; Francis and Schipper 1999; Jones 2003; Lev and Zarowin 1999). Studies using actual operating cash flows as proxy for future operating cash flows do not have such inherent problems.

2.7.2 Contradictory evidence on comparative predictive abilities of earnings, operating cash flow and operating cash flows combined with aggregated/disaggregated accruals

A second major research theme are comparative studies on the abilities of operating cash flows combined with aggregated accruals, earnings-only and operating cash flows-only in predicting future operating cash flows. These studies have also reported contradictory and inconclusive findings.
Some prior studies have documented that the ability of the combined operating cash flows with aggregated accruals is superior to both aggregated earnings and operating cash flows in predicting future operating cash flows (Al-Attar and Hussain 2004; Barth et al. 2001; Ebaid 2011). The predictive powers are further enhanced when the accruals components of earnings are disaggregated into the major accrual components comprising of accounts receivable changes, accounts payable changes, inventory changes, depreciation expense, amortisation expenses and other accruals and combined with operating cash flows (Al-Attar and Hussain 2004; Barth et al. 2001; Ebaid 2011).

However, a study based on Thai listed companies (Chotkunakitti 2005) has reported that operating cash flows are superior to earnings and operating cash flows combined with aggregated/disaggregated accrual components in predicting future operating cash flows. Some other studies have also documented no discernible difference between the abilities of operating cash flows combined with accruals and operating cash flows for future operating cash flows prediction (Stammerjohan and Nassiripour 2001; Supriyadi 1998).

2.7.3 Limited empirical studies on the ability of EBITDA in predicting future operating cash flows

Capital market investors are more confident in EBITDA, which are computed before expensing depreciation and amortisation costs, compared to net income in measuring performance (Misund et al. 2005). This was discussed in section 2.6.2. Since EBITDA exclude depreciation and amortisation, which are non-cash (discretionary accrual) expenses, financial analysts often use it as proxy for cash generated from operations and basis for forecasting operating cash flows when estimating the value of the firm (Berk et al. 2009; Misund et al. 2005). It is arguably more reliable than sales or earnings in forecasting operating cash flows since it reflects a company’s operating efficiency and independent of the gearing level (Berk et al. 2009; Berk et al. 2011).

Various studies have examined different forms of cash flow measurements in predicting future operating cash flows (Bowen et al. 1986; Farshadfar et al. 2008; Murdoch and Krause 1990; Perry and Stokes 1992; Quirin et al. 1999). Prior empirical studies have
documented the value relevance of historical EBITDA information in association with share market returns (Florou and Chalevas 2010; Misund et al. 2005). Furthermore, EBITDA margin, computed as EBITDA divided by sales, is identified as a key performance indicator representing operating performance in driving value (Florou and Chalevas 2010).

Despite EBITDA’s importance as an alternative performance measurement and valuation construct, there is limited empirical research examining EBITDA’s ability in predicting future operating cash flows. There are also limited empirical evidence on the relative predictive powers of EBITDA in comparison with earnings, accruals and operating cash flows, especially within the Malaysian context.

2.7.4 Pooling information across different industries: unreliable findings

Most research on the predictive ability of earnings, accruals and cash flow components assumed that the cross sectional approach is acceptable across different industries and pooled information for firms across a variety of different industries and sizes (such as Barth et al. 2001; Chotkunakitti 2005; Ebaid 2011; Farshadfar et al. 2008). However, prior research have documented that the characteristics of different industries (Palepu et al. 2000) with different earnings volatility (Dechow and Dichev 2002) and sizes (Dechow and Dichev 2002; Farshadfar et al. 2008; Hodgson and Clarke 2000) have different implications on future cash flows prediction.

Hence, the cross sectional approach adopted by most prior studies (such as Cheng and Hollie 2008; Chotkunakitti 2005; Farshadfar et al. 2008) may contain errors that can cause biasness in the findings.

2.7.5 Limited empirical studies within the Malaysian context.

Future operating cash flows prediction studies were mostly conducted in the developed countries, such as the United States (such as Barth et al. 2001; Dechow et al. 1998; Finger 1994; Murdoch and Krause 1989 and 1990; Stammerjohan and Nassiripour 2001; Waldron and Jordan 2010), Australia (Arthur and Chuang 2006; Farshadfar et al. 2008;
Habib 2010; Percy and Stokes 1992), United Kingdom (Al-Attar and Hussain 2004; Arnold et al. 1991) and New Zealand (Scholer 2006; Seng 2006). Only a few studies were conducted in developing countries with emerging capital markets, such as Egypt (Ebaid 2011), Indonesia (Supriyadi 1998) and Thailand (Chotkunakitti 2005).

The differences in accounting policies and statutory requirements between countries, specifically code-law regimes and common-law regimes, can influence the predictive ability of accrual-based earnings and operating cash flows (Hollister et al. 2008). The long term accruals reported in code-law countries are superior to those of common-law countries in predicting one year-ahead future operating cash flows (Hollister et al. 2008). Accounting practices and disclosures are strongly associated with cultural values and may differ across nations (Perera 1989). Furthermore, developed countries have different industrial characteristics, size and earnings volatility compared to the developing countries. Consequently the findings from the other nations may not be readily generalisable to a developing nation such as Malaysia due to the differences in the nature and characteristics of industries, business cycles, accounting practices and statutory requirements.

There are limited empirical studies providing direct evidence on the abilities and relative strength of earnings, accruals and operating cash flows in predicting future operating cash flows within the Malaysian context. Prior studies conducted in Malaysia have mainly investigated and documented that reported accounting and cash flows information (namely earnings, cash flows, intangible assets, earnings per share and equity book value) are value relevant in explaining share market returns (such as Cheng and Mohamad 2008; Kadri et al. 2009 and 2010; Shukor et al. 2009). Moreover, there are limitations in using share prices for prediction studies as share prices may reflect all kinds of information that can distort the findings (Arthur and Chuang 2006; Ebaid 2011; Yoder 2006) and may not fully incorporate the firm’s fundamentals (Sloan 1996; Yang 2000), as described in section 2.6.4. Other related studies in Malaysia that investigated the relevance of financial ratios derived from accounting information in predicting corporate bankruptcy have also documented that financial ratios relating to profitability, cash flows, asset
utilisation efficiency and leverage level are relevant predictors of corporate distress (Abdullah et al. 2008; Low et al. 2001; Muhamad-Sori et al. 2006; Muhamad-Sori et al. 2001). These studies do not provide direct empirical evidence on the predictive abilities of accrual-based and cash-based measures for future operating cash flows within the context of Malaysia.

Financial analysts in Malaysia perceive that the ability of cash flows information are superior to earnings in predicting future cash flows (Shukor et al. 2011), which contradicted the perspective of standard setters. Such perception by financial analysts in Malaysia is not substantiated with direct empirical evidence as there are limited studies investigating this phenomenon within the Malaysian context. Due to recent developments, research reports comprising of forecasts and recommendations prepared by financial analysts from reported accounting information and other relevant information of listed Malaysian companies participating in the CBRS scheme are required to be disseminated freely and quickly to all investors via the internet, as described in section 1.4 (Bursa Malaysia 2011c). Such research reports prepared by financial analysts can influence investment decisions by investors (Clement and Tse 2003, Coen et al. 2009 and Mozes 2003). Consequently there is an urgent need to investigate the relative strengths of accrual-based accounting and cash flows information as predictors of future operating cash flows since such information are often used by financial analysts when forecasting company performance and assist investors in Malaysia to make more informed investment decisions.

2.8 Research Problem, Research Questions and Hypotheses
The previous section identified and summarised the research issues and gaps from reviewing extant literature pertaining to the research area. This section describes the research problem, the research questions and the hypotheses developed to answer the research questions.
2.8.1 Research problem

Users of financial statements emphasised on the importance of cash flow prediction as part of making economic decisions (Elliott and Elliott 2007; Seng 2006). The IASB has indicated the preference for accrual accounting over cash accounting in preparing financial statements as the accrual method mitigates the timing and matching distortions inherent in cash accounting basis (IASB 2001, paragraph 22). However, extant literature on the comparative abilities of accrual-based and cash-based accounting measures as predictors of future cash flows remains contentious, as highlighted in section 2.7.

There are scarce studies providing direct empirical evidence on the ability and the comparative strengths of earnings, accruals, operating cash flows and EBITDA for future operating cash flows prediction within the Malaysian context. Prior studies are mostly conducted in other countries, predominantly the United States, which is not easily generalisable to the Malaysian context.

The manufacturing sector is an important aspect of Malaysia’s economy since this sector comprises of nearly 25% (RM817.7 billion) of Malaysia’s Gross Domestic Product and the industrial products manufacturing sector contributes nearly one third of the total manufacturing output (Department of Statistics Malaysia 2011). Focusing on this important industry, the main research problem to be resolved is as follows:

“To what extent can historical earnings, operating cash flows, accruals and EBITDA accounting information predict the future operating cash flows of listed Malaysian industrial products manufacturing companies?”

This study seeks to provide insights on the abilities and the relative strengths of accrual-based and cash-based accounting information for future operating cash flows prediction by extending prior studies conducted in other countries to the Malaysian setting. It intends to address the research issues identified from extant literature review, as summarised in section 2.7 and contribute to the current body of knowledge.
2.8.2 Research questions

This section develops the research questions relating to the research problem.

2.8.2.1 Earnings and operating cash flow as predictors of future operating cash flows

Prior studies have documented that historical accrual-based earnings and operating cash flows information are able to predict future operating cash flows (such Barth et al. 2001; Dechow et al. 1998; Farshadfar et al. 2008; Waldron and Jordan 2010). However, prior studies have reported contradictory findings on the comparative abilities of earnings and operating cash flows in predicting future operating cash flows, which was highlighted as a research issue in section 2.7.1. Furthermore, these studies were mainly conducted in the more developed countries, predominantly the United States, with different industry characteristics, earnings volatility, accounting standards and regulatory environment compared to Malaysia. Extant literature have documented that different industry characteristics (Palepu et al. 2000) with different earnings volatility (Dechow and Dichev 2000) and sizes (Dechow and Dichev 2002; Farshadfar et al. 2008; Hodgson and Clarke 2000) have different impact to future operating cash flows. Prior studies have pooled accounting information across different industries and this approach may distort the findings, as discussed in section 2.7.4. Consequently, the findings from such studies may not be readily generalisable to the Malaysian context.

There are scarce studies on the abilities of earnings and operating cash flows as predictors of future operating cash flows within the Malaysian context, especially research focusing on the important Malaysian industrial products manufacturing industry. Related prior prediction studies within the Malaysian context have mainly investigated and documented that specific accrual-based accounting information, such as earnings, equity book value, intangible non-current assets and cash flows, are value relevant in explaining share market returns (such as Cheng and Mohamad 2008; Kadri et al. 2009 and 2010; Pirie and Smith 2008; Shukor et al. 2009), as described in section 2.6.3.1. Other related prior studies have also documented that financial ratios derived from accounting information relating to profitability, leverage, operating efficiency and liquidity are able
to predict financial distress for listed Malaysian firms (such as Abdullah et al. 2001; Muhamad-Sori et al. 2006; Muhamad-Sori et al. 2001), as discussed in section 2.6.3.2. However, these studies do not provide empirical evidence directly substantiating the abilities of past earnings and operating cash flows information in predicting future operating cash flows for the Malaysian industrial products manufacturing sector. Consequently, the research questions are:

**Research question 1**
Do historical earnings have the significant ability to predict the future operating cash flows of listed Malaysian industrial products manufacturing companies?

**Research question 2**
Do historical operating cash flows have the significant ability to predict the future operating cash flows of listed Malaysian industrial products manufacturing companies?

2.8.2.2 Operating cash flows combined with aggregated/disaggregated accrual components as predictors of future operating cash flows

Earnings consist of accruals and operating cash flows components (Chotkunakitti 2005; Dechow 1994; Dechow and Dichev 2002; Dechow et al. 2008). Accruals are cash payments or cash receipts that are deferred to future periods and the future working capital investment decisions by management (Barth et al. 2001). Prior studies (such as Al-Attar and Hussain 2004; Barth et al. 2001; Chotkunakitti 2005; Dechow et al. 1998; Ebaid 2011) have investigated the incremental explanatory ability of aggregated accruals by combining the aggregated accruals with operating cash flows. These studies examined the predictive ability of the combined model and in comparison with operating cash flows-only and earnings-only models, as described in section 2.5.2. Some prior studies have also decomposed the aggregated accruals into the individual components (such as accounts receivable, accounts payable and depreciation) and combined these disaggregated accrual components with operating cash flows to examine the predictive abilities of combined model and also comparing against the earnings-only and operating cash flows-only model (Al-Attar and Hussain 2004; Barth et al. 2001; Chotkunakitti
2005; Ebaid 2011). These studies have documented that aggregated/disaggregated accruals have the incremental explanatory abilities in predicting future operating cash flows but the relative predictive abilities of these models remain contradictory, as highlighted in section 2.7.2 (Al-Attar and Hussain 2004; Barth et al. 2001; Ebaid 2011).

These prior studies were conducted in other countries, predominantly the United States, with differing business characteristics, earnings volatility, accounting practices and statutory regimes compared to Malaysia. The accounting requirements and statutory regime of a country is also documented to affect the predictive ability of accounting information for future operating cash flows (Hollister et al. 2008). The long term accruals reported in code-law countries are documented as superior to those of common-law countries in predicting one year-ahead future operating cash flows (Hollister et al. 2008). Furthermore, these studies have also pooled information across a cross section of industries that may cause distortions in the findings, which was highlighted as a research issue in section 2.7.4. Hence, the findings from these prior studies may not be easily generalisable to the Malaysian context.

There are limited studies examining the abilities of aggregated/disaggregated accrual components as predictors of future operating cash flows within the Malaysian context, especially for the Malaysian industrial products manufacturing industry. Related prior studies within the Malaysian context have mainly investigated and documented that that accrual-based and cash-based accounting measures are value relevant in explaining share market returns (such as Cheng and Mohamad 2008; Kadri et al. 2009 and 2010; Pirie and Smith 2008; Shukor et al. 2009) and that financial ratios derived from accounting information are able to predict financial distress for listed Malaysian firms (such as Abdullah et al. 2001; Muhamad-Sori et al. 2006; Muhamad-Sori et al. 2001). However, these studies did not provide empirical evidence directly substantiating the ability of aggregated/disaggregated accruals combined with operating cash flows in predicting the future operating cash flows for the industrial products manufacturing sector in Malaysia. Consequently, the research questions are:
**Research question 3**

Do historical operating cash flows combined with aggregated accruals have the significant ability to predict the future operating cash flows of listed Malaysian industrial products manufacturing companies?

**Research questions 4**

Do historical operating cash flows combined with disaggregated accrual components have the significant ability to predict the future operating cash flows of listed Malaysian industrial products manufacturing companies?

**2.8.2.3 EBITDA as predictor of future operating cash flows**

Analysts often used EBITDA as proxy for cash flow from operating activities and basis for forecasting future operating cash flows (Berk et al. 2009; Berk, et al. 2011; Misund et al. 2005). Prior research has examined and documented that historical EBITDA have value relevance in explaining stock returns (Florou and Chalevas 2010; Misund et al. 2005), as described in section 2.6.2. These studies indirectly implied that EBITDA have the ability to predict future operating cash flows. However, there are limitations in using share prices for such prediction studies as share prices may not efficiently incorporate all relevant information about the fundamentals of the company and may also reflect a variety of information (Arthur and Chuang 2006; Ebaid 2011; Sloan 1996; Yoder 2006), as described in section 2.6.4. Furthermore, these prior empirical studies were conducted in other countries and used a cross sectional approach when pooling accounting information across a variety of different industries and sizes, as highlighted in section 2.7.4. It may not be easily generalisable to the Malaysian context, especially within the industrial products manufacturing sector, due to differences in business characteristics, earnings volatility, accounting reporting requirements and statutory regimes.

Empirical research in Malaysia has mainly examined and concluded that accrual-based and cash-based accounting measures have value relevance in explaining share market returns (such as Cheng and Mohamad 2008; Kadri et al. 2009 and 2010; Pirie and Smith
2008; Shukor et al. 2009) and that financial ratios developed from accounting information are able to predict financial distress for listed Malaysian firms (such as Abdullah et al. 2001; Muhamad-Sori et al. 2006; Muhamad-Sori et al. 2001), as highlighted 2.6.3. However, these studies do not provide empirical evidence directly confirming that EBITDA have the ability to predict future operating cash flows, especially for listed Malaysian industrial products manufacturing companies. Hence, the research question is:

**Research question 5**
Do historical EBITDA have the significant ability to predict the future operating cash flows of listed Malaysian industrial products manufacturing companies?

2.8.2.4 **Comparative abilities of accrual accounting information and operating cash flows information for future operating cash flows prediction**

Comparative studies on the predictive abilities of earnings, accruals and operating cash flows for future operating cash flows remain contradictory and inconclusive, as highlighted by the research issues in section 2.7.1 and 2.7.2.

Prior studies, which have investigated and compared the predictive abilities of earnings and operating cash flows, have reported contradictory findings. This was highlighted in section 2.7.1. Some studies have concluded that earnings are superior to operating cash flows in predicting future operating cash flows (such as Dechow et al. 1998; Ebaid 2011; Greenberg et al. 1986; Largay and Stickney 1980; Murdoch and Krause 1990; Pae 2005; Seng 2006; Wilson 1986) while other studies have documented that operating cash flows are superior to earnings for future operating cash flows prediction (such as Austin and Andrew 1989; Barth et al. 2001; Bowen et al. 1986; Chotkunakitti 2005; Farshadfar et al. 2008; Habib 2010; Penham and Yehuda 2009; Stammerjohan and Nassiripour 2001; Waldron and Jordan 2010). Additionally, some other studies have reported no discernible differences between the abilities of earnings and operating cash flows in predicting future operating cash flows (Arnold et al. 1991; McBeth 1993; Pfeiffer et al. 1998).
Another major research theme examined the incremental predictive abilities of aggregated/disaggregated accruals by comparing the abilities of operating cash flows combined with accruals as predictors of future operating cash flows against earnings and operating cash flows. The findings from these studies were also contradictory, as highlighted in section 2.7.2. Some studies have documented that the combined model is superior to other predictors and that disaggregating the accruals into the individual accruals components further strengthens the predictive ability of the models (Al-Attar and Hussain 2004; Barth et al. 2001; Ebaid 2011). However, other research has concluded that operating cash flows, as a single predictor, is superior to earnings and operating cash flows combined with aggregated/disaggregated accruals in predicting future operating cash flows (Chotkunakitti 2005). No discernible differences between the operating cash flows combined with accrual components and the operating cash flows as a single predictor for future cash flows prediction were reported by other studies (Stammerjohan and Nassiripour 2001; Supriyadi 1998).

Related prior studies that have compared the value relevance of earnings, accruals and operating cash flows in explaining share market returns have also reported contentious findings. Some prior studies have reported that earnings are superior to operating cash flows in explaining share market returns (such as Cotter 1996; Francis et al. 2000; Haw et al. 2001; Penham and Yehuda 2009; Subramanyam and Venkatachalam 2001) and other studies have documented that the explanatory abilities of operating cash flows are more superior to earnings (Hodgson and Clarke 2000; Pourheydari and Ahmadi 2008). Some prior research has also reported no discernible differences between earnings and operating cash flows in explaining share market returns (Cheng et al. 1997a and 1997b). Other capital market studies have documented that accruals are superior to operating cash flows (Guay et al. 1996; Subramanyam 1996) and earnings (Chia et al. 1997) in explaining share market returns while other research has reported that operating cash flows are superior to accruals (Pourheydari and Ahmad 2008).

There are limited studies that have directly compared accrual-based and cash-based accounting measures for future operating cash flows prediction within the Malaysian
context, especially for the industrial products manufacturing sector. Prior studies are mainly conducted in other countries, which may not be easily generalisable within the Malaysian context due to differences in business characteristics, earnings volatility, accounting practices and statutory regime, as highlighted in section 2.7.5. Related prior studies within the Malaysian context have documented that accounting information, namely earnings, equity book value and intangible non-current assets and cash flows, are value relevant in explaining share market returns (Cheng and Mohamad 2008; Kadri et al. 2009 and 2010; Pirie and Smith 2008; Shukor et al. 2009), as described in section 2.6.3.1. However, these studies do not compare directly the abilities of accrual-based accounting and operating cash flows information for future operating cash flows prediction.

Financial analysts in Malaysia perceive that cash flows information is a better predictor of future operating cash flows than accrual-based accounting information, such as earnings (Shukor et al. 2011). Such perception contradicted with standard setters that has emphasised that accrual-based accounting information are superior to cash flows information in predicting future operating cash flows (FASB 1978). Furthermore, extant literature is contentious on the comparative abilities of accounting and operating cash flows information in predicting future operating cash flows. Consequently, the research question is:

**Research question 6**
Which of the following: earnings, operating cash flows, operating cash flow combined with aggregated accruals, operating cash flows combined with disaggregated accrual components or EBITDA model has the most superior ability in predicting the future operating cash flows of listed Malaysian industrial products manufacturing companies?

Each of the research questions from one to six is interrelated and relevant to the research problem. Research questions one, two and five investigate the ability of earnings, operating cash flows and EBITDA accounting information in predicting future operating cash flows. Research questions three and four investigate the potential incremental ability of aggregated/disaggregated accrual components when combined with operating cash flows.
flows for future operating cash flows prediction. Lastly, research question six compares the abilities of earnings, operating cash flows, operating cash flows combined with aggregated/disaggregated accrual components and EBITDA in predicting future operating cash flows. Such key accrual-based accounting and cash flows information is often used to measure the firm’s performance and in assessing the company’s ability to generate future operating cash flows. By seeking answers to these inter-related research questions, this study provides substantiating empirical evidence on the comparative abilities of these accrual-based and cash-based accounting measures in predicting the future operating cash flows of listed Malaysian industrial products manufacturing corporations. This approach is consistent to prior studies, such as Al-Attar and Hussain (2004); Barth et al. (2001), Chotkunakitti (2005) and Ebaid (2011).

2.8.3 Research hypotheses and conceptual model development

The previous section identified the research questions related to the research problem based on reviewing extant literature. This section develops the research hypotheses and the corresponding conceptual models to predict the answers to the research questions. A hypothesis is a proposition regarding relationships between variables that can be empirically tested (Zikmund 2000). These hypotheses should be rationally linked to a research question and a theory and are tested to provide answers to the research questions or provide supporting empirical evidence to a theory (Neuman 2006).

2.8.3.1 Hypothesis 1

Forecasting future operating cash flows is an important aspect of the decision making process (Obinata, 2002). A main objective of financial reporting is to provide relevant information to users (such as investors, creditors and lenders) to enable them to predict future operating cash flows (FASB 1978, paragraph 37).

Empirical studies have provided evidence that past earnings, which are derived from accrual accounting basis, have the ability to predict future operating cash flows (such as Chotkunakitti 2005; Ebaid 2011; Francis 2008; Greenberg et al. 1986; Habib 2010; Pae 2005; Percy and Stokes 1992; Seng 2006; Waldron and Jordan 2010), as described in
section 2.5.1. This is also supported by related empirical studies that have documented that past earnings are associated with market returns (such as Charitou et al. 2001; Dechow 1994; Francis et al. 2000; Guay and Sidhu 2001; Haw et al. 2001; Penman and Sougiannis 1998; Penman and Yehuda 2009; Subramanyam and Venkataguchalam 2001).

There are limited studies within the Malaysian context that provide empirical evidence directly substantiating the ability earnings to predict future operating cash flows. Nevertheless, related studies in Malaysia, as demonstrated in section 2.6.1, have documented that earnings have value relevance in explaining share market returns (Cheng and Mohamad 2008; Pirie and Smith 2008). Furthermore, as described in section 2.6.3.2, financial ratios that are primarily associated with profitability, cash flows, efficiency in asset utilisation and leverage have the ability to predict corporate distress (Low et al. 2001; Muhamad-Sori et al. 2006; Muhamad-Sori et al. 2001). These studies indirectly suggested that earnings have the ability to predict future operating cash flows. Accounting standards have also stated that accrual accounting is the preferred method of reporting financial performance as accrual-based earnings provide a measure of current operating performance that enable users to forecast future operating cash flows (IASB 2001; Yang 2000). Hence, relating to research question 1:

Hypothesis 1 posits that historical earnings have the significant ability to predict the future operating cash flows of listed Malaysian industrial products manufacturing companies.

The null hypothesis states that historical earnings do not have the significant ability to predict the future operating cash flows of listed Malaysian industrial products manufacturing companies.

**Earnings model**

The conceptual earnings model guiding the regression models development and data collection to test hypothesis 1 is illustrated in Figure 2.2. Findings from testing hypothesis 1 should indicate that earnings have the significant ability to predict future
operating cash flows. Past earnings are expected to be positive associated with future operating cash flows based on extant literature.

**Figure 2.2 Earnings model for future operating cash flows prediction**

![Diagram of earnings model](image)

Source: Developed for this study.

**2.8.3.2 Hypothesis 2**

Historical cash flow information is expected to be relevant in forecasting future operating cash flows. This information should enable users to assess the deviations from previous cash flow forecasts, reconcile between the reported cash flows and profits as well as evaluating the impact from price changes (FRS 107; MASB 2007). Users require this information to evaluate the “amount, timing and certainty of future operating cash flows” (MASB 2007, paragraph 5).

Prior studies have provided empirical evidence that past operating cash flows information have the ability to predict future operating cash flows (such as Al-Attar and Hussain 2004; Barth et al. 2001; Chotkunakitti 2005; Ebaid 2011; Farshadfar et al. 2008; Habib 2010; Krishnan and Largay 2000; Quirin et al. 1999; Waldron and Jordan 2010), as discussed in section 2.5.1. Other related empirical studies have also provided supporting evidence that operating cash flows information is useful and has value relevance in explaining capital market returns (Hodgson and Clarke 2000; Pourheydari and Ahmadi 2008).

There is limited empirical evidence directly confirming the ability of operating cash flows in predicting future operating cash flows within the Malaysian context. Nevertheless, related capital market research in Malaysia has investigated and documented that operating cash flows has value relevance in explaining share market
returns (Cheng and Mohamad 2008). Furthermore, financial ratios mainly relating to profitability, cash flows, efficiency in asset utilisation and leverage have the predictive ability for corporate distress (such as Low et al. 2001; Muhamad-Sori et al. 2006; Muhamad-Sori et al. 2001; Sulaiman et al. 2001). These studies indirectly implied that operating cash flows have the ability to predict future operating cash flows. Accounting standards have also indicated that cash flows information reported in the cash flow statement is relevant in evaluating the ability of the company to generate future cash flows (IASB 2009; MASB 2010). Hence, relating to research question 2:

Hypothesis 2 posits that historical operating cash flows have the significant ability to predict the future operating cash flows of listed Malaysian industrial products manufacturing companies.

The null hypothesis states that historical cash flows do not have the significant ability to predict the future operating cash flows of listed Malaysian industrial products manufacturing companies.

**Operating cash flows model**

The conceptual operating cash flows model guiding the regression models development and data collection to test hypothesis 2 is illustrated in Figure 2.3. Findings from testing hypothesis 2 should indicate that past operating cash flows have the significant ability to predict future operating cash flows. Past operating cash flows are expected to be positively associated with future operating cash flows based on prior research.

**Figure 2.3  Operating cash flows model for future operating cash flows prediction**

![Operating cash flows model](source: Developed for this study.)
2.8.3.3 Hypothesis 3

Earnings or net income reported under the accrual accounting basis is a combination of accruals and cash flows (Dechow 1994; Dechow and Dichev 2002; Dechow et al. 2008). Prior studies have combined aggregated accruals with operating cash flow components and compared the ability of the combined model, earnings and operating cash flows models in predicting future operating cash flows (Al-Attar and Hussain 2004; Barth et al. 2001; Chotkunakitti 2005; Ebaid 2011), which was described in section 2.5.2. Despite the conflicting evidence on the relative superiority of these accounting measures for future cash flows prediction, prior studies have documented that the model comprising of both operating cash flows and aggregated accruals are significant in predicting future operating cash flows and accruals have incremental explanatory abilities for future operating cash flows (Al-Attar and Hussain 2004; Barth et al. 2001; Chotkunakitti 2005; Ebaid 2011; Stammerjohan and Nassiripour 2001). Related capital market studies have also documented that investors do distinguish between accruals and cash flows, which are components of earnings (Dechow et al. 2008).

There are limited studies in Malaysia that have provided empirical evidence directly confirming that operating cash flows combined with accruals are able to predict future operating cash flows. Related prior studies in Malaysia have documented that specific accounting information, namely earnings, equity book value, intangible non-current assets and cash flows information, are value relevant in explaining share market returns (such as Cheng and Mohamad 2008; Kadri et al. 2009 and 2010; Pirie and Smith 2008; Shukor et al. 2009), as described in section 2.6.3.1. Financial ratios derived from the accounting information of Malaysian companies associated with profitability, cash flows, asset utilisation efficiency and leverage are also documented to have the ability for predicting financial distress (such as Abdullah et al. 2008; Muhamad-Sori et al. 2006; Muhamad-Sori et al. 2001), as reported in section 2.6.3.2. These studies indirectly implied that accrual-based accounting and cash flows information are able to predict future operating cash flows.
Accrual accounting are expected to mitigate the timing and matching issues associated with cash accounting (Dechow 1994; IASB 2001) and enhance the comprehensiveness of accounting information by capturing information relating to future periods (Athukorala and Reid 2003), as discussed in sections 2.4.2.3 and 2.4.2.4. Consequently, combining accruals with operating cash flows is expected to provide more relevant and better performance measurement in assessing the ability to generate future operating cash flows. Hence, relating to research question 3:

Hypothesis 3 posits that historical operating cash flows combined with aggregated accruals have the significant ability to predict the future operating cash flows of listed Malaysian industrial products manufacturing companies.

The null hypothesis states that historical operating cash flows combined with aggregated accruals do not have the significant ability to predict the future operating cash flows of listed Malaysian industrial products manufacturing companies.

**Operating cash flows combined with aggregated accruals model**

The conceptual model guiding the regression models development and data collection to test hypothesis 3 is illustrated in Figure 2.4. Findings from testing hypothesis 3 are expected to indicate that operating cash flows combined with accruals have the significant ability to predict future operating cash flows.

**Figure 2.4  Operating cash flows combined with aggregated accruals model for future operating cash flows prediction**

![Operating cash flows combined with aggregated accruals model](118)

Source: Developed for this study.
2.8.3.4 Hypothesis 4

Accrual accounting is the recommended accounting practice when preparing financial statements as it mitigates the timing and matching issues inherent in cash flow reporting and provides more comprehensive and relevant information in assisting the decision making process (IASB 2001). Accruals comprised of a combination of deferral accounts (such as prepayments) and accrual accounts (such as accounts payable and accounts receivable) (Francis and Smith 2005).

Prior studies have examined the incremental explanatory ability of disaggregated accrual components (such as accounts receivable changes, accounts payable changes and inventory changes) for future operating cash flows, as demonstrated in section 2.5.2. These studies have combined the disaggregated accrual components with operating cash flows and evaluated the predictive ability of the combined model for future operating cash flows and in comparison with earnings and operating cash flows models (Al-Attar and Hussain 2004; Barth et al. 2001; Ebaid 2011; Stammerjohan and Nassiripour 2001). These studies have documented that the combined model have the ability to predict future operating cash flows and some studies have reported that disaggregating the accruals into the individual components improves the predictive ability of the model (Al-Attar and Hussain 2004; Barth et al. 2001; Ebaid 2011).

Related empirical studies have also documented that major accrual components and operating cash flows have incremental explanatory powers for share market returns, as examined in section 2.6.1.2 (Bernard and Stober 1989; Charitou and Ketz 1990; Cotter 1996; Green 1999; Guay et al. 1996; McLeay et al. 1997; Rayburn 1986). Capital market studies have also reported that the different components of accruals impact share valuations as the stock market considers the amount of discretionary and non-discretionary accruals when pricing shares (Guay et al. 1996; Pae 2005; Subramanyam 1996). Discretionary accruals refer to those accruals estimated by management, such as provisions for bad debts, while non-discretionary accruals refer to expenses payable, such as rental.
There are limited studies in Malaysia that have directly examined the incremental predictive ability of disaggregated accrual components in predicting future operating cash flows, especially for the industrial products manufacturing industry. Prior related studies in Malaysia have mainly documented that specific accrual-based and cash-based accounting measures are value relevant in explaining share market returns (such as Cheng and Mohamad 2008; Kadri et al. 2009 and 2010; Pirie and Smith 2008; Shukor et al. 2009) and financial ratios derived from accounting information mainly relating to profitability, leverage, operating efficiency and liquidity are able to predict financial distress (such as Abdullah et al. 2008; Muhamad-Sori et al. 2006; Muhamad-Sori et al. 2001). These studies have provided indirect evidence that specific accrual-based accounting and cash flow information are relevant predictors of future operating cash flows within the Malaysian context.

Accrual accounting is expected to improve the comprehensiveness of accounting information by capturing information relating to future periods (Athukorala and Reid 2003) and mitigate the timing and matching issues associated with cash accounting (Dechow 1994; IASB 2001), as discussed in sections 2.4.2.3 and 2.4.2.4. Accruals are determined as variation of the non-cash working capital elements of the balance sheet items, such as accounts receivable changes, accounts payable changes and inventory changes, depreciation and amortisation expenses (Cheng and Hollie 2008). Each major accrual component captures different information content relating to cash payments and receipts that are deferred and have different implications for future operating cash flows (Barth et al. 2001; Dechow et al. 1998), as described in section 2.5.2. Consequently, combining the disaggregated accrual components with operating cash flows are expected to improve the ability of these accounting measures to forecast future operating cash flows. Thus, relating to research question 4:

Hypothesis 4 posits that historical operating cash flows combined with disaggregated accrual components have the significant ability to predict the future operating cash flows of listed Malaysian industrial products manufacturing companies.
The null hypothesis states that historical operating cash flows combined with disaggregated accrual components do not have the significant ability to predict the future operating cash flows of listed Malaysian industrial products manufacturing companies.

**Operating cash flows combined with disaggregated accrual components model**

The conceptual model guiding the regression models development and data collection to test hypothesis 4 is illustrated in Figure 2.5. Findings from testing hypothesis 4 should indicate that operating cash flows combined with disaggregated accrual components have the ability to predict future operating cash flows.

**Figure 2.5 Operating cash flows combined with disaggregated accrual components model for future operating cash flows prediction**

![Diagram](image)

Source: Developed for this study.
**2.8.3.5 Hypothesis 5**

EBITDA are computed by excluding depreciation and amortisation expenses from operating income (Keown et al. 2005). It is an important cash flow measurement and is often used to reflect cash flow from operations when forecasting operating cash flows for the purpose of valuing the firm (Berk et al. 2009; Berk et al. 2011; Florou and Chalevas 2010; Misund et al. 2005), as described in section 2.6.2. Financial analysts often use this as a key performance measurement reflecting the operational efficiency driving the value of the company (Berk et. al. 2009; Berk et al. 2011; Florou and Chalevas 2010).

There are limited studies providing direct empirical evidence on the predictive ability of EBITDA for future operating cash flows. However, related prior capital market studies have documented that historical EBITDA have value relevance in explaining share market returns (Florou and Chalevas 2010; Misund et al. 2005), as described in section 2.6.2. These studies indirectly implied that EBITDA has the ability to explain future operating cash flows. Since it excludes the gearing effects, EBITDA are expected to be more reliable than sales or earnings when estimating future operating cash flows and the value of the firm (Berk et. al. 2009; Berk et al. 2011; Florou and Chalevas 2010). Hence, relating to research question 5:

Hypothesis 5 posits that historical EBITDA have the significant ability to predict the future operating cash flows of listed Malaysian industrial products manufacturing companies.

The null hypothesis states that historical EBITDA have no significant ability to predict the future operating cash flows of listed Malaysian industrial products manufacturing companies.

**EBITDA model**

The conceptual EBITDA model guiding the regression models development and data collection to test hypothesis 5 is illustrated in Figure 2.6. Findings from testing hypothesis 5 should indicate that EBITDA have the significant ability to predict future
operating cash flows. EBITDA are expected to be positively correlated with future operating cash flow since it represents the operational performance in driving value of the company.

Figure 2.6 illustrates the model guiding the regression models development and data collection to test hypothesis 5.

**Figure 2.6  EBITDA model for future operating cash flows prediction.**

Source: Developed for this study.

2.8.3.6  Hypothesis 6
A primary purpose of financial statements is to enable users to evaluate the company’s ability to generate future operating cash flows when making economic decisions (IASB 2001; MASB 2007). When preparing financial statements, the generally accepted accounting convention recommended by the accounting standard setters is accrual accounting (IASB 2001, paragraph 22). Earnings prepared under the accrual accounting basis is expected to be more useful than cash flows when evaluating performance as the accrual convention eliminates the matching and timing issues associated with cash accounting that distort performance (Birt et al. 2008; Bowen et al. 1987; Cheng et al. 1997b; Chotkunakitti 2005; Dechow 1994; Penham and Yehuda 2009), as discussed in section 2.4.2.3. Furthermore, FASB (1978) emphasises that accrual-based accounting information has superior ability than cash flows information in assessing the company’s ability to generate future operating cash flows due to the limited information content within cash receipts and payments.

Earnings are a combination of accruals and operating cash flows components (Dechow 1994; Dechow and Dichev 2002; Dechow et al. 2008). Accruals comprised of the non-
cash working capital elements of the balance sheet items, such as accounts receivable changes, accounts payable changes and inventory changes, depreciation and amortisation expenses (Cheng and Hollie 2008). Each of these major accrual components has different information content in relation to deferred cash payments and receipts and has different implications for future operating cash flows (Barth et al. 2001; Dechow et al. 1998). Aggregated earnings place the same degree of emphasis on all the components of earnings, thus masking the effect of each earnings component (Al-Attar and Hussain 2004; Barth et al. 2001; Ebaid 2011). Disaggregating earnings into the components of operating cash flows and aggregated accruals and further disaggregating the accruals into the individual accrual components (such as accounts receivable, accounts payable and depreciation expense) are expected to enhance the predictive ability for future operating cash flows since the different contributions and information content of each accrual component are able to take effect (Al-Attar and Hussain 2004; Barth et al. 2001; Ebaid 2011). Hence, disaggregated accrual components are expected to have incremental explanatory powers beyond that within aggregated accruals. This perspective is also supported by related prior capital market studies, which have documented that the share prices do differentiate and incorporate the different components of accruals, namely discretionary and non-discretionary accruals (Guay et al. 1996; Pae 2005; Subramanyam 1996), as discussed in section 2.6.1.2. Hence, relating to research question 6:

Hypotheses 6 posits that the ability of operating cash flows combined with disaggregated accrual components model is the most superior compared to earnings, operating cash flows, operating cash flows combined with aggregated accruals and EBITDA models in predicting the future operating cash flows of listed Malaysian industrial products manufacturing companies.

The null hypothesis states that the ability of operating cash flows combined with disaggregated accrual components model is not the most superior compared to earnings, operating cash flows, operating cash flows combined with aggregated accruals and EBITDA models in predicting the future operating cash flows of listed Malaysian industrial products manufacturing companies.
2.9 Conclusion

This chapter demonstrated the importance of future operating cash flows prediction and reviewed extant literature on the two parent disciplines, specifically accrual and cash accounting principles. The characteristics and nature of accrual and cash accounting principles were compared and contrasted. Extant literature on the abilities of earnings, operating cash flows and accruals information in predicting future operating cash flows was examined as the immediate discipline. Research issues and gaps were identified and summarised from these reviews. The research problem and research questions were established based on the current gaps identified in extant literature. Hypotheses and the conceptual models were developed based on extant literature to predict the answers to these research questions.

The following Chapter 3 develops the research paradigm, the research design and the methodology to test the hypotheses.
CHAPTER 3

Methodology

3.1 Introduction

The previous chapter two reviewed the extant literature on the importance of forecasting operating cash flows and the two parent disciplines, which are accruals and cash accounting principles. The immediate discipline relating to the comparative abilities of earnings, accruals and operating cash flows in predicting future operating cash flows was also reviewed. Additionally, related studies on the comparative explanatory abilities of accounting and operating cash flows in explaining share market returns were examined. The research problem, research questions and the hypotheses were also developed in the previous chapter.

This chapter develops and justifies the research paradigm, research design and research methodology to collect data and conduct hypothesis testing. It is structure into thirteen sections. The introduction and chapter overview are described in section 3.1. Four main paradigms guiding this research are evaluated and the appropriate paradigm for this study is justified in section 3.2. These paradigms are positivism, interpretivism, critical theory and realism. Three main types of accounting research approaches, which are normative, positive and descriptive pragmatic approaches, are examined to select the most appropriate category for this study in section 3.3. Three main types of studies, which are exploratory, descriptive and explanatory research, are evaluated to develop the most appropriate research design and methodology in section 3.4. The conceptual framework used in developing the multiple linear regression models as proxies for the prediction models are described in section 3.5. The suitability of other statistical models is evaluated in section 3.6. The appropriateness of the prediction horizon is examined in section 3.7. The approaches used to measure the variables are described in section 3.8. The development of the regression models are demonstrated in section 3.9 while the statistical techniques used in evaluating the predictive ability, comparative strength and validity of the models are described in section 3.10. The methods used for data collection and
sampling are described in section 3.11. The research validity, reliability and objectivity are addressed in section 3.12. The ethical considerations are examined in section 3.13 and section 3.14 concludes the chapter. The structure of this chapter is outlined in figure 3.1.

**Figure 3.1 Chapter 3 Structure: Methodology**

- 3.1 Introduction
- 3.2 Research Paradigm Justification
- 3.3 Approaches in Accounting Research
- 3.4 Research Design
- 3.5 Conceptual Framework for Prediction Models Development
- 3.6 Evaluating Other Statistical Techniques
- 3.7 Prediction Horizon
- 3.8 Measurement of Variables
- 3.9 Regression Models Development
- 3.10 Statistical Testing Techniques
- 3.11 Data Collection
- 3.12 Research Validity, Reliability and Objectivity
- 3.13 Ethical Considerations
- 3.14 Conclusion

Source: Developed for this study.
3.2 Research Paradigm Justification

The approach to research depends on the philosophical stance or paradigm researchers perceive the social world. The researcher refers to paradigms to organise their observations and these are the lenses through which the researcher interprets reality, infused with their experience, knowledge and feelings (McMurray 2008; Neuman 2006; Saunders et al. 2003). It is the overall conceptual framework guiding the researcher in their research and the choice of paradigm adopted influences the research design and the data collection approach undertaken (Bryman and Bell 2003; Sobh and Perry 2005). This section examines and justifies the appropriate paradigm and the associated elements guiding this study.

There are four main paradigms guiding the researcher, categorised as positivism, interpretivism, critical theory and realism (Healy and Perry 2000; McMurray 2008; Neuman 2006). Within each of these paradigms, there are three main elements. These are as follows (Healy and Perry 2000; McMurray 2008; Sobh and Perry 2005):

i) Ontology, which is the perception of reality;

ii) Epistemology, which is the involvement between the researcher and the researched and

iii) Methodology, which refers to how the information is collected.

There is no ‘right or wrong’ choice of paradigms when approaching a research. It is the researcher’s prerogative but the approach needs to be justified (McMurray 2008, p.27). Section 3.2.1 examines the interpretivism paradigm, section 3.2.2 evaluates the critical theory paradigm, section 3.2.3 examines the realism paradigm and lastly, section 3.2.3 examines the positivism paradigm.

3.2.1 Interpretivism

Interpretivism emphasises the existence of multiple constructed realities relative to the context and shared meanings resulting from the social interactions of people (Neuman 2006). It is associated to “heumeneutics”, implying that the real meaning is obscured and embedded within the context (Neuman 2006, p.94) and “constructionism or social
constructionism”, implying that reality is socially constructed (Saunders et al. 2003, p.84). People interpret different meanings to situations, which affect their actions and interactions with the environment within the context of their socially constructed perception of reality. Researchers adopting this paradigm seek to comprehend the subjective meanings people socially construct and appreciate the complexities of human experience, motivations and interactions (Bryan and Bell, 2003; Neuman 2006; Saunders et al. 2003).

Interpretivists adopts a value position of “relativism”, that is all values are equally valid for an individual and no single value is better than others (Neuman 2006, p.94). The research is value laden and meanings embedded in all situations, which should be explicitly recognized in the study (McMurray 2008; Neuman 2006). The epistemological stance requires the researcher to gain access to people’s subjective perceptions of meanings and interpret their social actions from their perspective (Bryan and Bell 2003). Interpretivists aim to provide rich insights on complex human socially constructed realities within specific contexts (Saunders et al. 2003). As it involved active researcher participation, the findings can be subjective since this depends on the researcher's perception of reality. However, due to the specific contextual manner of interpretivist studies, the findings from such studies may not be generalisable to other contexts (Neuman 2006; Saunders et al. 2003). The subjective nature of this approach may be unsuitable for more objective research that involves economic, technological or organisational realities (Healy and Perry 2000).

This research seeks to investigate the comparative abilities of accrual-based versus cash-based accounting measures in predicting future cash flows. The aim is to provide empirical evidence on the extent to which historical earnings, accruals, EBITDA and operating cash flows information are able to predict the future operating cash flows of listed Malaysian industrial products manufacturing corporations. The interpretive paradigm is inappropriate for this study as this paradigm is more concerned with providing a subjective insight on the complexities of human interactions than testing law-like theories. This is an explanatory research using statistical methods and secondary
numerical accounting data to test causal-effect hypothesis. This research also seeks to resolve the issues identified from reviewing extant literature, as summarised in section 2.7, to provide deeper insights to investors on the reported numerical accounting and operating cash flows information relevance in generating sustainable future operating cash flows. The findings should assist in improving the economic decision making process of investors. It is relatively objective, generalisable and does not involve evaluating the social context within which people construct their realities. Hence, the interpretive approach is not suitable for this study.

3.2.2 Critical Theory

Critical theory emphasises on transformational research to challenge society norms and values (Healy and Perry 2000). It seeks to expose myths and uncover hidden truths to empower less powerful people, which may transform the social order (Neuman 2006). It takes a strong value position approach to radically emancipate people from their historical structures and strongly entrenched beliefs (Healy and Perry 2000).

Critical theory approach is associated with the realist orientation in that meanings are socially constructed but these are historically shaped by structures operating at the “real level” which are not easily observable (Neuman 2006, p.96). Since there are several levels of reality, studies and theoretical concepts over time enable us to gain insights on the surface, empirical reality, which will then further the understanding on the deeper actual level of reality (Neuman 2006).

Critical theorists’ approach is interpretative through close reflexive-dialectic interaction between researcher and participant with the process of gaining knowledge involved integrating observations, reflection and action (Neuman 2006). The researcher seeks to interpret the socially constructed meanings by people to radically transform their perceptions and beliefs (Sobh and Perry 2005). This approach is more qualitative than quantitative in nature. They generally utilise the historical comparative method or ethnography, emphasising on uncovering underlying structures to cause transformational
change (Neuman 2006). Critical theory studies are subjective and is strongly value laden (Healy and Perry 2000).

This research seeks to examine the comparative predictive abilities of accrual-based and cash-bash accounting measures for future operating cash flows. The aim is to provide empirical evidence on the extent to which historical earnings, accruals, EBITDA and operating cash flows information are able to predict future operating cash flows of listed Malaysian industrial products manufacturing companies. The subjective nature of critical theorists’ approach is inappropriate for this study as this is an explanatory research on how numerical accounting and operating cash flows information are able to predict future operating cash flows. It intends to extend prior studies to test hypothesis in an objective and generalisable manner using statistical methods. The findings should enhance the understanding of investors and other financial statement users on the reported numerical financial information usefulness in evaluating the listed Malaysian companies’ capability to generate sustainable future operating cash flows. This should assist investors in making more informed economic decisions. This study does not involve interpreting socially constructed meanings by individuals nor seek to radically change or challenge current industry norms nor perceptions. Consequently, the critical theory paradigm is not suitable for this study.

3.2.3 Realism
Realism focuses on the meanings associated with people’s perception of reality (Easterby, Thorpe and Lowe 1991). It explains that external reality exists independently from human perceptions but recognizes that subjective realities are constructed from human social interactions (Saunders et. al, 2003). This makes realities 'imperfectly and probabilistically apprehensible' (Healy and Perry 2000, p.119). This perception of reality depends on the triangulation of other perceptions to give a single apprehensible view of reality, which is difficult to be operationalised (Lincoln and Guba 1985, p.431). The findings are probably true as oppose to that of the positivist’s absolute truth (Healy and Perry 2000, p.119).
Realism research predominantly uses qualitative methods when collecting data and focuses on people’s attitudes and socially constructed realities (Easterby et al. 1991; Sobh and Perry 2005). Qualitative methods such as interviews and focus groups have close participation between the researcher and the participants. Realism research should be conducted using multiple methods to provide a better comprehension of the embedded and unobservable reality.

This study seeks to investigate the comparative abilities of accrual-based versus cash-based accounting measures for future operating cash flows prediction. It aims to provide empirical evidence on the extent to which earnings, accruals, EBITDA and operating cash flows information are able to predict future operating cash flows for listed Malaysian industrial products manufacturing corporations. Realism is unsuitable for this research as this study does not seek to examine the socially constructed meanings assigned by people and there is no close involvement between the researcher and the participants. The results from this study should enhance the understanding of investors and other financial statement users on the reported numerical accounting and operating cash flows information relevance in assessing the capability to generate sustainable future operating cash flows. This is an explanatory study extending prior studies to test causal-effect hypotheses using standardised statistical quantitative methods on secondary historical accounting numerical data in an objective and generalisable manner. The findings from this research should enable investors to make more informed economic decisions. Hence, realism paradigm is inappropriate for this study.

3.2.4 Positivism

Positivism emphasises on an absolute truth to reality, objectivity and hypothesises that the observable phenomenon can be explained using causal generalizations (McMurray 2008; Neuman 2006; Saunders et. al. 2003). Positivists seek to identify universal causal laws to enable control and predictability (Sekaran 2000).

Positivists start with a cause-effect relationship, which is derived from theory, to explain an observed phenomenon and emphasised on quantitative research methods (Healy and
Perry 2000; Neuman 2006). The other three paradigms utilise mainly qualitative methods, whereby there is active researcher-participant involvement to better comprehend the subjective meanings constructed by the participants being observed. Positivists prefer using quantitatively data to measure objectively and provide value-free empirical evidence, which are not influenced by social, cultural or other factors (Neuman 2006).

Positive studies assume laws and principles can be developed and generalisable for various situations and there is an underlying reality discoverable by an independent observer (Tinker, Merino and Neimark 1982). However, positive researchers are criticized for ignoring the complexities of human social interactions, which are complex and fluid rather than static (Healy and Perry 2000; Hines 1988; Neuman 2006). This approach may be inappropriate for research where people interact in a multifaceted manner. A better insight in such circumstances may be gained by undertaking in-depth case studies. However, positivists argued that such case study research is too specific to a particular organization, time or place and not generalisable to other situations (Deegan 2005). Positivists emphasise on highly structured and rational systematic process, with data collected and analysed in an objective and value-free manner (Neuman 2006). Positivists rationally link the abstract ideas to specific measures of the social world and remain independent and neutral when interpreting evidence and replicating other studies (Neuman 2006; Saunders et al. 2003). This approach is scientific and the findings are expected to be more objective, generalisable and value-free compared to the interpretivist, critical theory or realism approach.

This research seeks to investigate the comparative abilities of accrual-based and cash-based accounting measures for future operating cash flows prediction. It aims to provide empirical evidence on the extent to which past earnings, accruals, EBITDA and operating cash flows information are able to predict the future operating cash flows of listed Malaysian industrial products manufacturing companies. Positivism paradigm is most appropriate for this research as the purpose is to replicate and extend prior studies to test theory and not build theory. This study intends to use quantitative methods to test causal-
effect hypotheses using numerical secondary historical accounting data to provide law-like causal generalizations to this accounting phenomenon. It also aims to provide a deeper comprehension on the comparative relevance of reported numerical financial information in forecasting future operating cash flows and address the current research issues identified from reviewing extant literature, which was summarised in section 2.7. The findings should assist investors in their decision making process. This positivistic approach is most suitable since this scientific approach is objective, uses standardised and replicable techniques and the findings are expected to be generalisable to other settings.

This section has examined the four main paradigms guiding research and justified the positivism paradigm as the most appropriate for this study. These paradigms and the associated elements of ontology, epistemology and methodologies are summarized in Table 3.1. The positivism paradigm was justified as the most appropriate paradigm guiding this study. The next section examines the main approaches undertaken by accounting researchers for accounting theory development and categorises the most suitable approach for this study that is aligned to the positivism paradigm.
<table>
<thead>
<tr>
<th>Elements</th>
<th>Interpretivism</th>
<th>Critical Theory</th>
<th>Realism</th>
<th>Positivism</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ontology</strong> (View of reality)</td>
<td>Numerous realities constructed from social interactions and meanings.</td>
<td>Reality is subjective and shaped by dominant values and social interactions over time.</td>
<td>Reality exists independently from human perceptions but recognizes subjective reality in social interactions. Realities only imperfectly and likely apprehensible.</td>
<td></td>
</tr>
<tr>
<td><strong>Epistemology</strong> (Involvement between researcher and researched)</td>
<td>Subjective, intentional involvement and value laden findings.</td>
<td>Subjective, intentional involvement, dominant value laden findings and emancipatory driven.</td>
<td>Objective but value aware. Findings probably true. Triangulate perceptions held pertaining to a single reality.</td>
<td></td>
</tr>
<tr>
<td><strong>Methodologies</strong> (How to discover knowledge)</td>
<td>Qualitative methods.</td>
<td>Qualitative methods.</td>
<td>Qualitative methods, but sometimes mix with quantitative methods.</td>
<td>Quantitative methods.</td>
</tr>
<tr>
<td></td>
<td>Inductive</td>
<td>Inductive</td>
<td>Possible mix of inductive and deductive (confirming /disconfirming)</td>
<td>Deductive</td>
</tr>
<tr>
<td></td>
<td>Case studies, ethnographies, action research and grounded theory.</td>
<td>Ethnographic, action research and grounded theory.</td>
<td>Triangulation of sources/methods. Instrumental case studies and survey.</td>
<td>Experiments and surveys</td>
</tr>
<tr>
<td>Methods (Tools)</td>
<td>Participant observation, interviews, focus groups, questionnaires.</td>
<td>Participant observation, interviews and questionnaires.</td>
<td>Interviews, focus group, questionnaires and structural equation modelling</td>
<td>Hypotheses empirical testing using inferential statistical techniques</td>
</tr>
</tbody>
</table>

3.3 Approaches in Accounting Research

Approaches in accounting theories development can be broadly classified into three main categories, which are *descriptive pragmatic accounting research*, *normative accounting research* and *positive accounting research* (Deegan 2005; Godfrey et al. 2006). The descriptive pragmatic research approach is examined in section 3.3.1, the normative research approach is evaluated in section 3.3.2 and the positive accounting approach is examined in section 3.3.3. Each of these three main accounting approaches are examined to select the most appropriate approach in developing accounting theory that is align with the positivism paradigm. Figure 3.2 illustrates these three main approaches in accounting theory development.

Figure 3.2 Main approaches in accounting theory development

![Diagram of approaches in accounting theory development](source: Developed for this study based on Deegan (2005) and Godfrey et al. (2006)).

3.3.1 Descriptive pragmatic research

When developing accounting theories, accounting practices can be carefully observed and documented to reveal patterns of regular behaviour, resulting in the development of hypotheses, which can be further confirmed by observing the accountants’ behaviours (Godfrey et al. 2006). This well established and the oldest way in developing accounting theory is known as the *descriptive pragmatic approach* (Godfrey et al. 2006, p.48). Common practices were observed and accounting conventions are developed based on these observations. This approach mainly *describes* current practices. Sterling (1970)
named this method as the *anthropological approach*. Sterling explained that after the accounting anthropologist has observed that the accounting person usually records a conservative number, this can generalized as the conservatism principle. Further testing can be conducted by monitoring the accounting person to ascertain whether this person does record conservative numbers (Sterling 1970).

Such inductive research approach to theory development assumed that the common accounting practice is the most appropriate practice. Deegan (2005, p.5) coined this perspective as ‘*accounting Darwinism*’, that is, accounting practice has evolved in a manner that only the best practice survived. When developing accounting theories, this approach was popular during the 1920’s until early 1960’s (Deegan 2005).

Various researchers criticized this inductive approach for only describing existing accounting practices and lacked critical evaluations on the way it should be conducted. It focuses only on the behavioural aspects of the accountant and not the measurement of the firm’s characteristics, such as profitability, assets and liabilities, which form the “*semantics of accounting phenomena*” (Godfrey et al. 2006, p.48). It only describes the status quo and is reactionary rather than proactively evaluate current practices to derive improvements (Gray, Owen and Maunders 1987). Consequently improvements are limited as this approach does not challenge existing practices.

The descriptive pragmatic approach is not appropriate for this study as this research does not intend to observe common behavioural accounting practices by accountants to induce and build theories. This study adopts the positivism paradigm in guiding this research to examine the comparative abilities of accrual-based accounting and operating cash flows information as predictors of future operating cash flows. This is an explanatory research replicating prior studies, which were conducted in other countries, within the Malaysian context to test causal-effect hypotheses using objective and generalisable statistical techniques on secondary numerical accounting data. This study aims to provide empirical evidence and explaining the extent earnings, accruals, operating cash flows and EBITDA information are able to predict future operating cash flows. It intends to provide deeper
insights and provide recommendations on the relevance of reported numerical accounting and operating cash flows information in assessing the ability of the listed Malaysian company in generating sustainable operating cash flows. The findings and recommendations from this study should assist investors and other users of financial statements to make more informed economic decisions. Hence, the descriptive pragmatic approach, which develops theories based by observing and describing current practices and does not provide recommendations to improve current practices, is not suitable for this study.

3.3.2 Normative research

Normative accounting research focuses on prescribing (as opposed to describing) how financial accounting should be reported based on judgments on the nature of information required by people (Deegan 2005, Godfrey et al. 2006). It usually prescribes the “ideal” accounting system to replace the conventional historical cost accounting system (Godfrey et al. 2006, p.53). This normative approach was dominant during the 1950’s and 1960’s and studies during this period were mainly addressing issues of fluctuating prices (Deegan 2005, Godfrey et al. 2006). These studies prescribed different accounting models that were considered more relevant than the conventional historical cost accounting when dealing with inflation.

Good scientific research requires hypothesis forming and testing (Watts 1995, p.299). A good scientific theory should be parsimonious, has clearly defined constructs, internally consistent, able to generate hypothesis that can be empirically tested, consistent with empirical evidence and able to give different perspective on things (Manning 2004). Normative (accounting) studies seek to prescribe how accounting practices (which does not exist) should be practised rather than describe or explain existing practices. Normative theories are based on goals that are established subjectively based on the judgements of the researcher and produce unfalsifiable prescriptions (Godfrey et al. 2006). These theories are criticised for prescribing accounting practices which are based only on anecdotal evidence, lacking supporting empirical observations and may not reflect existing accounting practices (Deegan 2005; Godfrey et al. 2006). This approach
is criticised for making assumptions on the accounting phenomenon and prescriptions deduced with little systematic evidence or testing (Deegan 2005; Dyckman and Zeff 1984; Godfrey et al. 2006). Since their objectives are not independent from subjectivity, it is impossible to assess the relevance of the objectives (Godfrey et al. 2006).

Normative research approach is unsuitable as this research does not intend to prescribe an ideal accounting system to replace the conventional accounting system. This research adopts the positivism paradigm in guiding this research to investigate the comparative abilities of reported accounting and operating cash flows information prepared using the existing accounting convention in predicting future operating cash flows. This is an explanatory research to test causal-effect hypotheses using objective and generalisable statistical techniques to provide empirical evidence explaining the extent earnings, accruals, operating cash flows and EBITDA information are able to predict future operating cash flows. It intends to provide deeper comprehension on the relevance of reported financial information in assessing the ability of listed Malaysian firms to generate sustainable future operating cash flows. The empirical findings and recommendations from this research should assist investors or users of financial statements in their economic decision making process. Hence, the normative research approach, which prescribes ideal accounting practices without much empirical evidence, is not appropriate for this study.

3.3.3 Positive accounting research

Descriptive accounting research seeks to describe accounting events while normative accounting research focus on prescribing what accounting practice (ideally) should have taken place. The focus of positive accounting research is different from descriptive and normative accounting research. It seeks to develop a theory to explain and predict accounting phenomenon (Deegan 2005; Godfrey et al. 2006). Positive research provides guidance in the search and explanation for empirical regularities (Watts and Zimmerman 1990, p.132). With positive accounting research, assumptions are initially made and through rational deductions, predictions are made about an accounting phenomenon (Henderson, Peirson and Brown 1992). When the predictions are tested against real
observations and the findings agreeable with sufficient accuracy, then there are adequate explanations regarding the phenomenon (Henderson et al 1992).

The term *positive accounting theory* was popularized by Watts and Zimmerman. Watts and Zimmerman (1986, p.2) adopted the term “positive” from economics to distinguish *positive accounting research* that seeks to explain or predict accounting practice from other (normative) accounting research.

Watts and Zimmerman (1986, p.2) elaborated that:

“The objective of accounting theory is to *explain* and *predict* accounting practices…. *Explanation* means providing reasons for observed practice. For example, positive accounting theory seeks to explain why firms continue to use historical cost accounting and *why* certain firms switch between a number of accounting techniques. *Prediction* of accounting practice means that the theory predicts unobserved phenomena.”

Table 3.2 summarised the key findings from notable pioneers of positive accounting researchers.
Table 3.2 Summary of pioneering positive accounting studies in chronological order

<table>
<thead>
<tr>
<th>Study</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beaver (1966)</td>
<td>Financial ratios derived from past accounting information are able to predict corporate failure.</td>
</tr>
<tr>
<td>Ball and Brown (1968)</td>
<td>Historical accounting information is value relevant in explaining market returns.</td>
</tr>
<tr>
<td>Altman (1968)</td>
<td>Developed multivariate model using financial ratios that can predict financial bankruptcy within two years.</td>
</tr>
<tr>
<td>Beaver (1968)</td>
<td>Information content in earnings announcements is relevant as it affects trading volume and market returns volatility.</td>
</tr>
<tr>
<td>Fama, Fisher, Jensen and Roll (1969)</td>
<td>Developed the Efficient Market Hypothesis (EMH). Capital market is highly competitive and share prices react and incorporate information in an efficient manner.</td>
</tr>
<tr>
<td>Jensen and Meckling (1976)</td>
<td>Developed agency theory. There is separation of ownership and control. Owners (principals) appoint managers (agents) to act on their behalf. Conflicting interests exist between them and measures should be taken to ensure goal congruence between them.</td>
</tr>
</tbody>
</table>

Source: Developed from extant literature.

Positive accounting research are often criticised for not recommending the most efficient accounting practice. Sterling (1990, p.130) criticized that the scope of positive accounting research is restrictive to descriptive questions and neglect to evaluate the situation and propose prescriptions. Accounting process is undertaken by people and critics argued that it is difficult for positive theories to explain and predict all human actions (Deegan 200). Nevertheless positive accounting research has been useful in predicting “how the world works” and should not be rejected simply because it may not predict every human behaviour (Watts and Zimmerman 1990, p.148).

Critics of research methodology disagreed on what constituted valid research, especially when researchers adopt different research paradigms. Debate on “methodology is a ‘no
win’ situation because each side argues from a different paradigm with different rules and no common ground” (Watts and Zimmerman 1990, p.149). When researchers adopt different perspectives, research methods, approach or theoretical assumptions in their research, conflicting opinions will continue to exist on the research validity and is never ending (Watts and Zimmerman 1990).

All accounting theories have limitations since these are merely generalisations of the underlying reality. Different accounting theories may exist because of the multifaceted nature of accounting from many perspectives. Various theories are developed to describe, explain or predict how accounting is used and should be used in various contexts. The preferred choice of accounting theory over others is dependent on the specific value judgments and perspectives of the individual and assumptions about the accounting issues (Deegan 2005).

Positive accounting studies seek to establish theory to explain and predict accounting phenomenon (Deegan 2005, Godfrey et al. 2005). This approach is most appropriate for this study as this research adopts the positivism paradigm to investigate the comparative abilities of accounting and operating cash flows information in predicting future operating cash flows. This is an explanatory research to replicate prior studies, which were conducted in other countries, to test causal-effect hypotheses using standardised quantitative methods and secondary sources of numerical accounting data. This study intends to explain the extent earnings, accruals, operating cash flows and EBITDA information are able to predict future operating cash flows. This study should provide a deeper comprehension on the relevance of reported financial information in assessing the ability of listed Malaysian firms within the industrial products manufacturing sector to generate sustainable future operating cash flows. The empirical findings and recommendations from this research should assist investors or users of financial statements in their economic decision making process. This study aims to provide law-like causal generalizations to the accounting phenomenon being examined in an objective manner. Hence, the positive accounting approach, which seeks to develop theories to
explain or predict an accounting phenomenon, is aligned to the positivism paradigm and most suitable for this study.

3.4 Research Design
The previous section examined the three broad approaches in accounting research guiding accounting theory development and justified positive accounting approach as the most appropriate approach for this study since it is aligned to the positivism paradigm. This section describes the research design appropriate for this study.

Research design is a plan to guide the researcher to organize the research activity, which includes identifying the methodology on where, what and how to collect and analyse data, in achieving the research purpose (Easterby et al. 1991). The elements within the research design and the data collection methodologies are aligned with the choice of paradigm adopted and should be consistent with each other (Bryman and Bell 2003; Easterby et al. 1991). There are three main types of business research classifications, which are examined in section 3.4.1. The research objectives are described in section 3.4.2 and the research methodology is discussed in section 3.4.3.

3.4.1 Classifications of research
There are three main classifications of research, which can be categorized as follows (Neuman 2006):

i. Exploratory research is to gain more insight into an unknown observable phenomenon;

ii. Descriptive research is to provide a comprehensive picture of a situation and

iii. Explanatory research builds on exploratory and descriptive research to explain the causes of a phenomenon, support or refute an explanation or prediction, extend or test existing theory.

This study is an explanatory research as it aims to extend prior research to investigate the comparative predictive abilities of accrual-based versus cash-based accounting information in predicting the future operating cash flows of listed Malaysian industrial
products manufacturing companies. This study is categorised as positive accounting research, which is aligned with the positivism paradigm.

3.4.2 Research objectives

The main research objectives are:

i. Provide empirical evidence that historical earnings, accruals, EBITDA and operating cash flows information have the significant ability to predict the future operating cash flows of listed Malaysian industrial products manufacturing corporations,

ii. Provide empirical evidence on the comparative predictive abilities of earnings, accruals, EBITDA and operating cash flows for the future operating cash flows of listed Malaysian industrial products manufacturing corporations,

iii. Explain the extent earnings, accruals, operating cash flows and EBITDA information are able to predict the future operating cash flows listed Malaysian industrial products manufacturing corporations,

iv. Narrow the gap in current literature and contribute to the existing body of knowledge.

3.4.3 Research methodology: quantitative versus qualitative

The paradigm embraced by the researcher will influence the approach to the research (McMurray 2008; Neuman 2006; Saunders et al. 2003). The positivism paradigm guiding this study were discussed and justified in section 3.2.4. This section describes the two main methodologies guiding the conduct of research, which are qualitative and quantitative orientations (Bryman and Bell 2003; Neuman 2006) and selects the most appropriate methodology aligned with the positivism paradigm.

Qualitative research relies on interpretive or critical social science to describe the complexities and various factors influencing a social phenomenon in a nonlinear and iterative research path within specific social-historical contexts (Neuman 2006). It predominantly emphasised on an inductive process between theory and research, mainly to build theories (Bryman and Bell 2003; McMurray 2008).
Qualitative researchers emphasise on descriptive words and their connotative images when collecting and analysing data rather than numerical information (McMurray 2008). These studies recognise individual perspectives on the research matter and embody the intimate participation of the researcher when studying and interpreting the subject matter within the context of the study (Neuman 2006). However, the researcher’s values, preconceptions, experience or beliefs may influence the trustworthiness or credibility of the study (McMurray 2008; Neuman 2006).

Quantitative research is bounded within the positivism paradigm, with preoccupation on measuring variables precisely and through a deductive approach, test hypotheses in a linear research path to explain a phenomenon (Neuman 2006). Quantitative approach seeks to minimize or remove the human factor and emphasised on the need for objectivity when conducting the research. The research methods selected are standardised, data analysis numerical based and statistically inclined (Bryman and Bell 2003; McMurray 2008; Neuman 2006). There is minimal researcher involvement to enable the study to be value free, replicable and generalisable across different settings, thus exceeding the confines of the specific context in which the research was conducted. Quantitative studies are longitudinal, cross sectional, survey and correlation studies (McMurray 2008).

Quantitative research seeks to give new insights to existing theories or extension to new settings/environment by formulating and testing causal-relationships using numerical evidence assigned to variables (Neuman 2006). The quantitative methodology research approach is most suitable for this study since this approach is aligned with the positivism paradigm and this explanatory research seeks to examine and provide empirical evidence explaining the extent numerical accounting and operating cash flows information are able to predict future operating cash flows. This study intends to test the causal-relationship between reported financial information and future operating cash flows and compare the predictive abilities of accounting and operating cash flows information for future operating cash flows within the context of the industrial products manufacturing industry in Malaysia. It aims to replicate and extend prior studies, which were conducted in other countries, to develop and test hypotheses using secondary sources of numerical
accounting data and statistical packages and provide findings that are replicable and
generalisable across different settings. The quantitative approach for this study that is
aligned with the positivism paradigm, is more value free, objective and less influenced by
the perspective of the researcher compared to the subjective nature of qualitative
research, which is aligned with the interpretive paradigm. This approach is also consistent
with prior studies that have adopted this quantitative methodology in future operating
cash flows prediction studies (such as Al-Attar and Hussain 2004; Barth et al. 2001;
Chotkunakitti 2005; Ebaid 2011; Farshadfar et al. 2008; Finger 1994; Kim and Kross
2005; Percy and Stokes 1992; Waldron and Jordan 2010; Yoder 2006). Hence, the
quantitative research methodology is most suitable for this study.

Table 3.3 summarised the main differences between qualitative and quantitative research
methodologies.

**Table 3.3  Main differences between qualitative and quantitative research**

<table>
<thead>
<tr>
<th><strong>Quantitative</strong></th>
<th><strong>Qualitative</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Numbers</td>
<td>Words</td>
</tr>
<tr>
<td>Point of view of researcher</td>
<td>Points of view of participants</td>
</tr>
<tr>
<td>Researcher distant</td>
<td>Researcher close</td>
</tr>
<tr>
<td>Theory testing</td>
<td>Theory emergent</td>
</tr>
<tr>
<td>Static</td>
<td>Process</td>
</tr>
<tr>
<td>Structured</td>
<td>Unstructured</td>
</tr>
<tr>
<td>Generalisation</td>
<td>Contextual understanding</td>
</tr>
<tr>
<td>Hard, reliable data</td>
<td>Rich, deep data</td>
</tr>
<tr>
<td>Macro</td>
<td>Micro</td>
</tr>
<tr>
<td>Behaviour</td>
<td>Meaning</td>
</tr>
<tr>
<td>Artificial settings</td>
<td>Natural settings</td>
</tr>
</tbody>
</table>

Source: Adapted from Bryman and Bell (2003) and Lincoln and Guba (1985).
3.5 Conceptual Framework For Prediction Models Development

The previous section examined and justified the quantitative research methodology as the most appropriate for this study. This section describes the conceptual framework that is aligned with the quantitative research methodology to develop the prediction models.

Concepts are the ideas or constructs that are the foundations of theory (Bryman and Bell, 2003). Quantitative researchers follow a deductive approach, whereby the researcher start with concepts and then devise measurement techniques to capture these concepts in quantitative form, thereby linking abstract ideas with numerical evidence about empirical reality (Neuman 2006). Once the concepts are operationalised, the concepts can be mainly categorised as either dependent or independent variables (Bryman and Bell, 2003).

Dependent variables are those that respond to variations in other variables while independent variables are those that cause variations in the dependent variables (McMurray 2008; Saunders et al. 2003). Dependent variables are the predicted variables that the researcher required explanations. Independent variables or predictors are the variables that may provide explanations regarding a phenomenon being investigated.

Prior studies adopted various statistical approaches in developing future operating cash flows prediction models. A number of studies have used the least square method to develop simple and multiple regression models as the prediction models. A simple regression or univariate regression is a linear model in which an outcome or variable is predicted from a single predictor variable. A multiple regression is one in which the outcome is predicted by a linear combination of two or more predictor variables (Field 2009). The least square method seeks to fit the observed data to a (prediction) model by minimising the sum of the squared deviations between the actual data and the model developed (Field 2009).

Prior literature examined the relative predictive ability of earnings and operating cash flows in predicting future cash flows by regressing current operating cash flows (as proxy
for future operating cash flows) on period-lagged earnings, period-lagged operating cash flows or period-lagged operating cash flows combined with accruals (such as Arthur and Chuang 2006; Barth et al. 2001; Chotkunakitti 2005; Farshadfar et al. 2008; Finger 1994; Greenberg et al. 1986; Kim and Kross 2005; Percy and Stokes 1992; Quirin et al. 1999; Yoder 2006). Some prior studies assumed the random walk model, implying that current period cash flows persist into the current and future periods (Barth et al. 2001; Dechow et al. 1998; Yoder 2006). Current working capital accruals, such as accounts receivable and accounts payable, were assumed received or paid in the following period (Yoder 2006).

Consistent to prior studies (such as Arthur and Chuang 2006; Barth et al. 2001; Cheng and Hollie 2008, Chotkunakitti 2005, Greenberg et al. 1986, Hollister et al. 2008; Stammerjohan and Nassiripour 2001), this research adopted the ordinary least squares method to develop simple and multiple regression models as proxy for future operating cash flows prediction models to test the hypotheses. Some researchers have also highly recommended this multiple linear regression method when testing theory (Studenmund and Cassidy, 1987). It is most suitable when testing causal relationships between variables whereby the variables are dichotomous nominal scale, interval or ratio and satisfy the normality assumptions (Manning and Munro 2006).

Simple and multiple regression models were developed to estimate the linear relationship between the predictors and the dependent variable. The generic regression model takes the form of:

\[ Y_t = a_0 + a_1 X_{t-1} + a_2 X_{t-2} + \ldots + a_i X_{t-i} + \varepsilon \]

Where \( Y_t \) is the outcome or predicted variable for the current year \( t \)

\( X_{t-i} \) is the predictor from the year \( t-i \),

\( i \) is the number of years lagged from year \( t \), which is one, two, or three years,

\( a_i \) is the regression coefficient associated with the predictor variable,

\( a_0 \) is the value of the outcome when the predictor is zero and

\( \varepsilon \) captures omitted factors (the error terms).
The regressions were conducted so that each set was repeated for each stage systematically using one, two and three years lagged variables. This approach is consistent with prior studies (such as Al-Attar and Hussain 2004; Barth et al. 2001; Chotkunakitti 2005). All the predictors were entered simultaneously into the regression at each stage using the ‘Enter’ method in SPSS, ensuring that the regression model considered all the variables as significant. This approach, as suggested by Field (2009), is appropriate as all the selected predictors are expected to contribute to the outcome based on theoretical justifications developed from prior studies.

3.6 Evaluating Other Statistical Techniques
This section examines the suitability of other statistical techniques, namely stepwise, logistic regression and discriminant analysis, for this research.

Stepwise technique seeks to find the best model fitting the data by selecting the predictor with the highest correlation with the dependent variable, one at a time (Field 2009). This technique is mainly suitable for exploratory model building, whereby there is no prior research about the phenomenon being studied, when causal-type explanations are not required and the researcher is only seeking to find the best model fitting the data (Agresti and Finlay 1986; Menard 1995). Stepwise technique may over-fit or under-fit the model, impacted by random data variations and the findings are unlikely replicable when retesting the regression models (Field 2009). This technique is inappropriate for this study, which is mainly theory testing and not theory building. There are adequate prior studies conducted in other countries to identify the relevant variables for this study. This study primarily extended prior research conducted in other countries in a new setting (Malaysia) and aims for the findings to be generalisable across different settings.

Logistic regression is a form of multiple regression whereby the dependent variable is a categorical variable (qualitative) and the independent variables are continuous or categorical (Field 2009). This statistical technique is unsuitable for this study as both the dependent and independent variables, which are numerical accounting (quantitative) data, are measured on an interval scale.
Discriminant analysis or discriminant function analysis is a statistical method that can be used to establish a linear mix of predictors that discriminates between two or more mutually exclusive and exhaustive groups (Baldwin 1986; Leano 2004). It is the most appropriate statistical technique to use when the dependent variable is categorical (qualitative) and the predictors are metric (quantitative) (Leano 2004; Manning and Munro 2006). Discriminant analysis is inappropriate for this study as the dependent variable for this study, which is numerical accounting data, is measured on a ratio scale.

Stepwise technique, logistic regression and discriminant analysis statistical techniques were considered for this study but concluded inappropriate for this study. Multiple regression techniques, which is consistent with prior studies of this nature and aligned with the quantitative research methodology, is most suitable for this study.

The next section describes the prediction horizon appropriate for this study.

### 3.7 Prediction Horizon

Extant literature documented that operating cash flows or earnings have incremental value over several years (such as Barth et al. 2001; Chokunakitti 2005; Greenberg et al. 1986; Habib 2010; Hollister et al. 2008; Stammerjohann and Nassiripour 2001). Different studies have examined different prediction horizon periods, predominantly between one to five years-ahead operating cash flows prediction. Each prediction period was evaluated separately by developing prediction models for each forecast period with the predictors (such as earnings, cash flows or accruals) lagged for one to five years, depending on the prediction horizon period examined. For example, Ebaid (2011), Farshadfar et al. (2008), Quirin et al. (1999) and Waldron and Jordan (2010) examined only one year ahead cash flow prediction, Seng (2006) examined one and two years ahead forecasts, Al-Attar and Hussain (2004), Chotkunakitti (2005), Habib (2010) and Hollister et al. (2008) examined one to three years ahead forecasts and Greenberg et al. (1986) examined one to five years ahead forecasts.
Empirical studies have reported contradictory findings on the extent of accounting information’s predictive abilities. Recent studies demonstrated that earnings were significant in predicting future operating cash flows up to three years ahead (Barth et al. 2001; Chotkunakitti 2005; Habib 2010). Barth et al. (2001) have also documented that disaggregating earnings into the individual components, which were cash flows and accruals components, enhanced the predictive abilities up to four years ahead. However, past cash flows is significant when predicting two years ahead cash flows but the predictive abilities diminish when predicting three years ahead cash flows forecast (Al-Attar and Hussain 2004; Hollister et al. 2008). The explanatory ability tends to diminish when the prediction horizon increases (Al-Attar and Hussain 2004; Barth et al. 2001; Chotkunakitti 2005; Hollister et al. 2008).

This study examined operating cash flow prediction for one to three years horizon since extant literature predominantly document that the predictive ability of accounting information diminishes beyond three years. Consequently the predictors are lagged up to three years, which is consistent with Al-Attar and Hussain (2004), Chotkunakitti (2005), Habib (2010) and Hollister et al. (2008).

3.8 Measurement of Variables

This section develops the measurement of the variables in the regression models that were developed to test the hypotheses. The variables for this study were earnings, accruals components, operating cash flows and EBITDA, which were consistent with prior studies (such as Al-Attar and Hussain 2004; Barth et al. 2001; Chotkunakitti 2005; Ebaid 2011).

The dependent variable (the predicted variable) in these regression models was the future operating cash flows, which is explained or predicted by the independent variables (the predictors). Section 3.8.1 describes the measurements of the predictors and section 3.8.2 describes the measurements of the dependent variables.
3.8.1 Independent variables (predictors)

3.8.1.1 Earnings measurement

Earnings or profit after tax but before extraordinary items, special items and discontinued operations were used as the predictors in the regression models. Only items arising from operating activities were assessed. Non-recurring items such as income or expenses derived from extraordinary items, special items, discontinued operations and non-operating transactions were excluded. This was to enable an unambiguous evaluation of cash and accruals components of income arising from continuing operations (Sloan1999). This earnings measurement was consistent with prior future cash flow prediction studies, such as Barth et al. (2001), Chotkunakitti (2005), Farshadfar et al. (2008), Jordan et al. (2007), Percy and Stokes (1992) and Stammerjohan and Nassiripour (2001).

The earnings predictors were lagged up to three years, following Al-Attar and Hussain (2004) and Chotkunakitti (2005). The earnings predictors were scaled by the average total assets to eliminate the potential spurious correlations from size effects and heteroskedasticity problems (Anderson et al. 2007, Barth et al. 2001; Collins and Hribar 2002; Farshadfar et al. 2008; Sloan 1996).

The earnings predictor was measured as follows:

\[
\text{EARN} = \frac{\text{Profit after tax but before extraordinary items}}{\text{Average Total Assets}}
\]

Where:

EARN was the earnings or profit after tax but before extraordinary items and discontinued operations scaled by the average total assets.

Average Total Assets = \((\text{Total assets book value at the beginning period} + \text{closing book value balance at the end of the period}) \div 2\).
3.8.1.2 Operating cash flows measurements

The actual net cash flow from operations as reported in the Cash Flow Statement was used as the predictors to develop the regression models. The preparation and reporting of the Cash Flow Statement are governed by the Malaysian accounting standard, FRS 107 and mandatory for all listed companies since July 1999 (Ng 2006). Cash flow from operations is appropriate since FRS 107 (MASB 2010, paragraph 5) emphasised that the elements within the historical operating cash flows are useful in predicting future operating cash flows. FRS 107 has also emphasised that cash flow from operations are generated from the “principal revenue-producing activities of the entity” (MASB 2010, paragraph 14). This information provides the main indicator on the ability of the company to generate adequate operating cash flows in the future to meet debt obligations, operating capability, provide dividend payments and make new investment without referral to external financing sources and is useful, when used together with other information, to forecast the future operating cash flows of the company (MASB 2010, paragraph 13).

Following Al-Attar and Hussain (2004) and Chotkunakitti (2005), these operating cash flows predictors were lagged up to three years in the regression models. These were scaled by average total assets to eliminate potential spurious correlations from size effects and heteroskedasticity problems (Anderson et al. 2007; Barth et al. 2001; Collins and Hribar 2002; Farshadfar et al. 2008; Sloan 1996).

The cash flows predictor was measured as follows:

\[ \text{CFO} = \frac{\text{Net cash flows from operating activities}}{\text{Average Total Assets}} \]

Where:

CFO is the actual net cash flows from operating activities reported in the cash flow statement scaled by the average total assets.
Average Total Assets = (Total assets book value at the beginning period + closing book value balance at the end of the period) divided by 2.

Some prior studies have estimated the net cash flow from operations (CFO) by adjusting the net income (before extraordinary items and discontinued operations) with changes in non-cash working capital (such as Largay and Stickney 1980; Greenberg et al. 1986; Gombola and Ketz 1983; Percy and Stokes 1992) while others have used the actual reported cash flows from operating activities in the cash flow statement (such as Barth et al. 2001; Cheng and Hollie 2008; Chotkunakitti 2005; Yoder 2006). This study used the actual reported cash flow from operations as disclosed in the cash flow statement. This approach is appropriate as research evidence has indicated that actual cash flows has incremental information compared to estimated cash flows as the latter may contain estimation errors and cause biasness (Austin and Bradbury 1995; Collins and Hribar 2002; Farshadfar et al. 2008). The use of operating cash flows as predictors in the prediction models are consistent with prior studies, such as Al-Attar and Hussain (2004), Barth et al. (2001), Chotkunakitti (2005), Ebaid (2011), Farshadfar et al. (2008), Jordan et al. (2007) and Quirin et al. (1999).

3.8.1.3 Accruals measurement
Accruals relate to the combination of deferral accounts (such as prepayments) and accrual accounts (such as accounts payable and accounts receivable) (Francis and Smith 2005). Prior studies have generally measured accruals using two different methods when investigating the ability of accrual component of earnings in predicting future cash flows (such as Al-Attar and Hussain 2004; Barth et al. 2001; Chotkunakitti 2005; Hollister et al. 2008; Stammerjohan and Nassiripour 2001; Yoder 2007). These two methods are described in this section.

Method 1
Earnings (EARN) or net income reported under the accrual accounting basis is a combination of cash flow from operations (CFO) and accruals (ACR) (Dechow 1994;
Dechow and Dichev 2002; Dechow, Richardson and Sloan 2008; Scholer 2006; Subramanyam 1996).

This can be represented as follows:

\[ \text{EARN} = \text{ACR} + \text{CFO} \]

Based on this principle, aggregated accruals is measured as the difference between earnings and operating cash flows, illustrated as follows:

\[ \text{ACR} = \text{EARN} - \text{CFO} \]

This measurement of accruals is consistent with Al-Attar and Hussain 2004; Chotkunakitti (2005), Dechow et al. (1998); Ebaid 2011; Hollister et al. (2008), Stammerjohan and Nassiripour (2001) and Yoder (2007).

**Method 2**

The second method used an accounting-based approach by measuring accruals as changes in non-cash working capital (which are changes in accounts receivable, accounts payable, inventory and other operating accruals) plus depreciation and amortisation expenses. Non-operating accruals, such as those relating to financing activities, are excluded. This approach is consistent with Al-Attar and Hussain (2004), Barth et al. (2001), Cheng and Hollie (2008), Chotkunakitti (2005), Ebaid (2011) and Stammerjohan and Nassiripour (2001). When preparing the cash flow statement, the indirect method in FRS 107 (MASB 2011, paragraph 18) recommends that earnings are adjusted for non-cash items (such as depreciation) and changes in the working capital (excluding cash) to derive the net cash flow from operations. This second method of measuring accruals is illustrated as follows:
ACR = ΔAR + ΔAP + ΔINV + ΔOTH + DEPR + AMORT

Where:
EARN is the earnings or profit after tax but before extraordinary items and discontinued operations,
ACR is the aggregated accruals during the period,
CFO is the net cash flow from operations,
ΔAR is the accounts receivable changes during the period,
ΔAP is the accounts payable changes during the period,
ΔINV is the inventory changes during the period,
ΔOTH is the other current assets and liabilities changes during the period,
DEPR is the depreciation expense during the period and
AMORT is the amortisation expense during the period.

Some prior studies have used only the second method while others adopted both methods when disaggregating earnings into the individual components of earnings. Barth et al. (2001) adopted only the second method and disaggregated accruals into the six major accrual components and examined the relative explanatory abilities of each of these accrual components while Al-Attar and Hussain (2004), Chotkunakitti (2005), Ebaid (2011) and Stammerjohan and Nassiripour (2001) used both methods to examine the predictive abilities of accruals. However, for the second method, Stammerjohan and Nassiripour (2001) have included deferred tax expense as an additional component while Al-Attar and Hussain (2004), Chotkunakitti (2005) and Ebaid (2011) did not include this deferred tax component due to the unavailability of deferred tax information and they further simplified the accruals measurement by combining depreciation and amortisation as one variable (DEPRM).

Stammerjohan and Nassiripour (2001) measured seven disaggregated accrual components as follows:

ACR = ΔAR + ΔAP + Δ INV + Δ OTH + Deferred Tax + DEPR + AMORT
Al-Attar and Hussain (2004), Chotkunakitti (2005) and Ebaid (2011) measured five major disaggregated accrual components as follows:

\[ \text{ACR} = \Delta \text{AR} + \Delta \text{AP} + \Delta \text{INV} + \Delta \text{OTH} + \text{DEPRM} \]

Additionally, Badertscher and Collins (2008) measured disaggregated accrual components consistently with Chotkunakitti (2005) in their study on the effects of earnings management impacting the ability of accruals in predicting future cash flows.

Following Al-Attar and Hussain (2004); Chotkunakitti (2005) and Ebaid (2011), the accrual predictors for this study were measured using the two methods. These predictors were lagged up to three years in the regression models and scaled by the average total assets to eliminate potential spurious correlations from size effects and minimize heteroskedasticity problem (Anderson et al. 2007; Barth et al. 2001; Collins and Hribar 2002; Farshadfar et al. 2008; Sloan 1996).

The accrual predictors were measured using two methods for this study as follows:

**Method 1:**

\[ \text{ACR} = \text{EARN} - \text{CFO} \]

And

**Method 2:**

\[ \text{ACR} = \Delta \text{AR} + \Delta \text{AP} + \Delta \text{INV} + \Delta \text{OTH} + \text{DEPRM} \]

Where:

ACR is the aggregated accruals scaled by average total assets,

EARN is the earnings or profit after tax but before extraordinary items and discontinued operations, scaled by average total assets,

CFO is the net cash flow from operations, scaled by average total assets,
ΔAR is the accounts receivable changes during the period, scaled by average total assets,
ΔAP is the accounts payable changes during the period, scaled by average total assets,
ΔINV is the inventory changes during the period, scaled by average total assets,
ΔOTH is the changes in other current assets and liabilities during the period, scaled by
average total assets,
DEPRM is the depreciation and amortisation expense during the period, scaled by
average total assets and
Average Total Assets = (Total assets book value at the beginning period + closing book
value balance at the end of the period) divided by 2.

3.8.1.4 Earnings before interest, tax, depreciation and amortisation (EBITDA)

EBITDA are computed as earnings excluding interest, tax, depreciation and amortisation
(Berk et al. 2009). Financial analysts often use EBITDA as an estimate of the continuing
cash flow from operations since it excludes depreciation and amortisation expenses,
which are not cash expenses (Berk et al. 2009). EBITDA variables were used as the
predictors in the regression models. Consistent with the other predictors in this study,
these predictors were lagged up to three years and scaled by the average total assets to
eliminate potential spurious correlations from size effects and heteroskedasticity
problems (Anderson et al. 2007; Barth et al. 2001; Collins and Hribar 2002; Farshadfar et
al. 2008).

This variable was measured as follows:

\[
\text{EBITDA} = \frac{\text{Net cash flow from operating activities}}{\text{Average Total Assets}}
\]

Where:
EBITDA are earnings before interest, tax, depreciation and amortization scaled by
average total assets.
Average Total Assets = (Total assets book value at the beginning period + closing book value balance at the end of the period) divided by 2.

3.8.2 Dependent variable

The objective for this study is to examine relative abilities of different financial information in predicting future cash flows. The actual net cash flows from operating activities (CFO) as reported in the cash flow statement in the current year was used as the dependent variable. This variable was scaled by the average total assets to eliminate potential spurious correlations from size effects and heteroskedasticity problems (Anderson et al. 2007; Barth et al. 2001; Collins and Hribar 2002; Farshadfar et al. 2008). The use of actual realised CFO as a proxy for expected future operating cash flows is consistent with prior research, such as Al-Altar and Hussain (2004), Barth et al. (2001), Cheng and Hollie (2008), Ebaid (2011), Farshadfar et al. (2008), Quirin et al. (1999) and Yoder (2006).

This variable was measured as follows:

\[
\text{CFO} = \frac{\text{Net cash flows from operating activities}}{\text{Average Total Assets}}
\]

Where:

CFO is the actual net cash flows from operating activities reported in the cash flow statement scaled by the average total assets.

The next section develops the regression models using these dependent and predictor variables to test the hypothesis.

3.9 Regression Models Development

The previous section 3.8 described the measurements of the dependent and predictor variables for this research. This section describes the regression models development to test each hypothesis.
3.9.1 Earnings model

Hypothesis 1 relates to the research question 1. It posits that historical earnings have the significant ability to predict the future operating cash flows of listed Malaysian industrial products manufacturing companies.

The conceptual earnings model expressing the expected relationship between past earnings and future operating cash flows was described in section 2.8.3.1. Following Al-Attar and Hussain (2004) and Chotkunakitti (2005), the simple and multiple regression models developed to test this hypothesis incorporated the lagged earnings up to three years as follows:

One year-lag earnings model:
\[
CFO_t = b_0 + b_1 EARN_{t-1} + \rho 
\]  
(Model 1)

Two years-lag earnings model:
\[
CFO_t = b_0 + b_1 EARN_{t-1} + b_2 EARN_{t-2} + \rho 
\]  
(Model 2)

Three years-lag earnings model:
\[
CFO_t = b_0 + b_1 EARN_{t-1} + b_2 EARN_{t-2} + b_3 EARN_{t-3} + \rho 
\]  
(Model 3)

Where:
- CFO\(_t\) is the net cash flow from operating activities for year \(t\) scaled by the average total assets;
- EARN\(_{t-1}\), EARN\(_{t-2}\) and EARN\(_{t-3}\) is profit after tax but before extraordinary items and discontinued operations in year \(t-1\) (one year lag), year \(t-2\) (two years lag) and year \(t-3\) (three years lag) respectively, scaled by the average total assets;
- \(b_0\) to \(b_3\) are the unknown regression coefficients and \(\rho\) captures omitted factors (error terms)

Based on prior studies, historical earnings are expected to express a positive relationship with future operating cash flows. Thus, if the earnings models are expected to be
significant in predicting future operating cash flows and have positive predictor coefficients.

3.9.2 Operating cash flows model

Hypothesis 2 relates to research question 2. It posits that historical operating cash flows have the significant ability to predict the future operating cash flows of listed Malaysian industrial products manufacturing companies.

The conceptual operating cash flows model developed in section 2.8.3.2 described the expected relationship between past operating cash flows and future operating cash flows. Following Al-Attar and Hussain (2004) and Chotkunakitti (2005), the simple and multiple regression models developed to test this hypothesis incorporated the lagged operating cash flows up to three years as follows:

One year-lag operating cash flows model:
\[ \text{CFO}_t = c_0 + c_1 \text{CFO}_{t-1} + \rho \]  
(Model 4)

Two years-lag operating cash flows model:
\[ \text{CFO}_t = c_0 + c_1 \text{CFO}_{t-1} + c_2 \text{CFO}_{t-2} + \rho \]  
(Model 5)

Three years-lag operating cash flows model:
\[ \text{CFO}_t = c_0 + c_1 \text{CFO}_{t-1} + c_2 \text{CFO}_{t-2} + c_3 \text{CFO}_{t-3} + \rho \]  
(Model 6)

Where:
\text{CFO}_t \text{, CFO}_{t-1} \text{, CFO}_{t-2} \text{ and CFO}_{t-3} \text{ are the net cash flow from operations for year } t, \text{ year } t-1 \text{ (one year lag), \ year } t-2 \text{ (two years lag) and year } t-3 \text{ (three years lag) respectively, scaled by the average total assets;}
\text{c}_0 \text{, c}_1 \text{,c}_2 \text{ and c}_3 \text{ are the unknown regression coefficients and } \rho \text{ captures omitted factors (error terms).}
Historical operating cash flows are expected to be positively related to future operating cash flows based on prior studies. Hence, these prediction models are expected to be significant and the predictor coefficients have positive signs.

3.9.3 Operating cash flows model combined with aggregated accruals model

Hypothesis 3, which relates to research question 3, posits that historical operating cash flows combined with accruals have the significant ability to predict the future operating cash flows of listed Malaysian industrial products manufacturing companies.

The conceptual models developed in section 2.8.3.3 described the expected relationship between historical operating cash flows combined with aggregated accruals and future operating cash flows. Current operating cash flows (as proxy for future cash flows) were regressed on past cash flow from operations combined with aggregated accruals components of earnings, lagged up to three years. Aggregated accruals (ACR) were computed as the difference between earnings and operating cash flows. This approach followed Al-Attar and Hussain (2004) and Chotkunakitti (2005). The regression models developed were as follows:

One year-lag operating cash flows combined with aggregated accruals model:
\[ \text{CFO}_t = d_0 + d_1 \text{CFO}_{t-1} + d_2 \text{ACR}_{t-1} + \rho \]  
(Model 7)

Two years-lag operating cash flows combined with aggregated accruals model:
\[ \text{CFO}_t = d_0 + d_1 \text{CFO}_{t-1} + d_2 \text{CFO}_{t-2} + d_3 \text{ACR}_{t-1} + d_4 \text{ACR}_{t-2} + \rho \]  
(Model 8)

Three years-lag operating cash flows combined with aggregated accruals model:
\[ \text{CFO}_t = d_0 + d_1 \text{CFO}_{t-1} + d_2 \text{CFO}_{t-2} + d_3 \text{CFO}_{t-3} + d_4 \text{ACR}_{t-1} + d_5 \text{ACR}_{t-2} + d_6 \text{ACR}_{t-3} + \rho \]  
(Model 9)

Where:
\( \text{CFO}_t \), \( \text{CFO}_{t-1} \), \( \text{CFO}_{t-2} \) and \( \text{CFO}_{t-3} \) are the net cash flow from operations for year \( t \), year \( t-1 \) (one year lag), year \( t-2 \) (two years lag) and year \( t-3 \) (three years lag) respectively, scaled by the average total assets;
ACR \(_{t-1}\), ACR \(_{t-2}\) and ACR \(_{t-3}\) is the aggregated accruals in year \(t-1\) (one year lag), year \(t-2\) (two years lag) and \(t-3\) (three years lag) scaled by the average total assets respectively; \(d_0, d_1, d_2, d_3, d_4, d_5\) and \(d_6\) are the unknown regression coefficients \(\rho\) captures omitted factors (error terms).

Historical operating cash flows combined with the aggregated accruals are expected to have a relationship with future operating cash flows based on prior studies. Hence, these prediction models are expected to have the significant ability in predicting future operating cash flows. Additionally, these models are expected to have stronger explanatory powers compared to the earnings and operating cash flows model based on prior research.

3.9.4 Operating cash flows combined with disaggregated accrual components model

Hypothesis 4 relates to research question 4. It posits that historical operating cash flows information combined with disaggregated accrual components have the significant ability to predict the future operating cash flows of listed Malaysian industrial products manufacturing companies.

The conceptual models developed in section 2.8.3.4 demonstrated the expected relationship between historical operating cash flows combined with disaggregated accrual components and future operating cash flows. Aggregated accruals were disaggregated into accounts receivable changes, accounts payable changes, inventory changes, other accruals changes, depreciation and amortisation expenses. This is consistent with Barth et al. (2001), Chotkunakitti (2005) and Stammerjohan and Nassiripour (2001). Regression models were developed to test this hypothesis by regressing current operating cash flows on past operating cash flows and disaggregated accrual components. Different accrual components have different explanatory abilities in predicting future operating cash flows (Barth et al. 2001; Chotkunakitti 2005). Aggregated accruals mask the effects of accrual components and disaggregating the accruals unmask the relative contributions of each accrual component.
Following Al-Attar and Hussain (2004) and Chotkunakitti (2005), the regression models were developed by combining the lagged (up to three years) individual disaggregated accrual components with the operating cash flows variables as follows:

One year-lag operating cash flows combined with disaggregated accrual components model:
\[ \text{CFO}_t = e_0 + e_1 \text{CFO}_{t-1} + e_2 \Delta \text{AR}_{t-1} + e_3 \Delta \text{AP}_{t-1} + e_4 \Delta \text{INV}_{t-1} + e_5 \Delta \text{OTH}_{t-1} + e_6 \text{DEPRM}_{t-1} + \rho \]  
(Model 10)

Two years-lag operating cash flows combined with disaggregated accrual components model:
\[ \text{CFO}_t = e_0 + e_1 \text{CFO}_{t-1} + e_2 \text{CFO}_{t-2} + e_3 \Delta \text{AR}_{t-1} + e_4 \Delta \text{AR}_{t-2} + e_5 \Delta \text{AP}_{t-1} + e_6 \Delta \text{AP}_{t-2} \]
\[ + e_7 \Delta \text{INV}_{t-1} + e_8 \Delta \text{INV}_{t-2} + e_9 \Delta \text{OTH}_{t-1} + e_{10} \Delta \text{OTH}_{t-2} + e_{11} \text{DEPRM}_{t-1} + e_{12} \text{DEPRM}_{t-2} + \rho \]  
(Model 11)

Three years-lag operating cash flows combined with disaggregated accrual components model:
\[ \text{CFO}_t = e_0 + e_1 \text{CFO}_{t-1} + e_2 \text{CFO}_{t-2} + e_3 \text{CFO}_{t-3} + e_4 \Delta \text{AR}_{t-1} + e_5 \Delta \text{AR}_{t-2} + e_6 \Delta \text{AR}_{t-3} + e_7 \Delta \text{AP}_{t-1} + e_8 \Delta \text{AP}_{t-2} + e_9 \Delta \text{AP}_{t-3} + e_{10} \Delta \text{INV}_{t-1} + e_{11} \Delta \text{INV}_{t-2} + e_{12} \Delta \text{INV}_{t-3} + e_{13} \text{DEPRM}_{t-1} + e_{14} \text{DEPRM}_{t-2} + e_{15} \text{DEPRM}_{t-3} + e_{16} \Delta \text{OTH}_{t-1} + e_{17} \Delta \text{OTH}_{t-2} + e_{18} \Delta \text{OTH}_{t-3} + \rho \]  
(Model 12)

Where:
\( \text{CFO}_t, \text{CFO}_{t-1}, \text{CFO}_{t-2} \) and \( \text{CFO}_{t-3}\) are net cash flow from operating activities for year \( t \), year \( t-1 \) (one year lag) , year \( t-2 \) (two years lag) and year \( t-3 \) (three years lag) respectively, scaled by average total assets;

\( \Delta \text{AR}_{t-1}, \Delta \text{AR}_{t-2} \) and \( \Delta \text{AR}_{t-3}\) are the accounts receivable changes during the period \( t-1 \) (one year lag), period \( t-2 \) (two years lag) and period \( t-3 \) (three years lag) respectively, scaled by average total assets;
$\Delta AP_{t-1}$, $\Delta AP_{t-2}$ and $\Delta AP_{t-3}$ are the accounts payable changes during the period $t-1$ (one year lag), period $t-2$ (two years lag) and period $t-3$ (three years lag) respectively, scaled by average total assets;

$\Delta INV_{t-1}$, $\Delta INV_{t-2}$ and $\Delta INV_{t-3}$ are the inventory changes during the period $t-1$ (one year lag), period $t-2$ (two years lag) and period $t-3$ (three years lag) respectively, scaled by average total assets;

$\Delta OTH_{t-1}$, $\Delta OTH_{t-2}$ and $\Delta OTH_{t-3}$ are the other current assets and current liabilities changes during the period $t-1$ (one year lag), period $t-2$ (two years lag) and period $t-3$ (three years lag) respectively, scaled by average total assets;

$DEPRM_{t-1}$, $DEPRM_{t-2}$ and $DEPRM_{t-3}$ are the depreciation and amortisation expense during the period $t-1$ (one year lag), period $t-2$ (two years lag) and period $t-3$ (three years lag) respectively, scaled by average total assets;

e_0$ to $e_{18}$ are the unknown regression coefficients and $\rho$ captures omitted factors (error terms).

Historical operating cash flows combined with the disaggregated accrual components of earnings are expected to explain future operating cash flows based on prior studies. Consequently, these prediction models are expected to be significant in explaining future operating cash flows variations. These models are also expected to have stronger explanatory abilities compared to the earnings, operating cash flows model and operating cash flows combined with aggregated accruals models based on prior studies.

### 3.9.5 EBITDA model

Hypothesis 5 relates to research question 5. It posits that historical earnings before interest, tax, depreciation and amortization (EBITDA) have the significant ability to predict the future operating cash flows of listed Malaysian industrial products manufacturing companies.
The conceptual models developed in section 2.8.3.5 demonstrated the expected relationship between EBITDA and future operating cash flows. Three regression models were developed to test the hypothesis by regressing current operating cash flows, as proxy for future cash flows, on past EBITDA. Consistent with the other prediction models developed for this study, the EBITDA regression models are lagged one, two and three years respectively as follows:

One year-lag EBITDA model:
\[ \text{CFO}_t = f_0 + f_1 \text{EBITDA}_{t-1} + \rho \]  \hspace{1cm} (Model 13)

Two years-lag EBITDA model:
\[ \text{CFO}_t = f_0 + f_1 \text{EBITDA}_{t-1} + f_2 \text{EBITDA}_{t-2} + \rho \]  \hspace{1cm} (Model 14)

Three years-lag EBITDA model:
\[ \text{CFO}_t = f_0 + f_1 \text{EBITDA}_{t-1} + f_2 \text{EBITDA}_{t-2} + f_3 \text{EBITDA}_{t-3} + \rho \]  \hspace{1cm} (Model 15)

Where:

- \( \text{CFO}_t \) is net cash flow from operations for year \( t \) scaled by average total assets;
- \( \text{EBITDA}_{t-1}, \text{EBITDA}_{t-2} \) and \( \text{EBITDA}_{t-3} \) are EBITDA during the period \( t-1 \) (one year lag), period \( t-2 \) (two years lag) and period \( t-3 \) (three years lag) respectively, scaled by average total assets;

EBITDA are expected to express a positive relationship with future operating cash flows since it is often used as a measurement of operational performance driving value and as an alternative estimated measurement of operating cash flows. Hence, if EBITDA have the ability to predict future operating cash flows, then the models are expected to be significant and the predictors have positive coefficients.
3.10  Statistical Testing Techniques

The previous section developed the multiple linear regression models as proxies for the prediction models to test the hypotheses. This section describes the statistical testing techniques used. Several underlying regression assumptions must be adhered to ensure the results from the parametric tests are valid and generalisable to the population (Field 2009; Levine et al. 2008). Section 3.10.1 describes the four main regression assumptions and the procedures used to ensure these assumptions are adhered. The statistical techniques to evaluate the predictive abilities, strength and validity of the models are described in section 3.10.2. The validation methods used to ensure that the findings are generalisable to other settings are described in section 3.10.3.

3.10.1  Regression assumptions

There are four main assumptions that must be adhered to enable the regression analysis to be valid and generalisations can be made about the population based on the regression analysis conducted on a sample (Levine et al. 2008). These assumptions are linearity, equal variance (homoscedasticity), independence of residuals and normality of residuals (Field 2009; Levine et al. 2008) These assumptions and the residual analysis used to check adherence to them are described as follows:

1.  **Linearity**

   The relationship between the dependent variable and the predictors is assumed to be linear (Field 2009; Levine et al. 2008). If the relationship is non-linear, then it is inappropriate to use a linear model since this will limit the generalisability of the findings (Field 2009).

2.  **Equal variance (Homoscedasticity)**

   The residuals variances should be constant or equal at each level of the predictor(s), which is known as homoscedasticity (Field 2009; Levine et al. 2008). The problem of heteroscedasticity will occur if the variances are very unequal (Field 2009).
The linearity and homoscedasticity assumptions can be checked by plotting a graph of standardised residuals against the standardised predicted values and visually examine this scatter-plot graph (Field 2009; Levine et al. 2008). The assumptions of linearity and homoscedasticity is adhered if the plots appeared like an array of dots randomly and evenly distributed around zero and there is no apparent pattern (Field 2009; Levine et al. 2008). Heteroscedasticity occurs in the data if the graph funnels out as it indicates increasing variances across the residuals and the assumption of linearity is violated if there appeared a curve pattern emerging from the graph (Field 2009).

The homoscedasticity and linearity assumptions are checked in this study by plotting the standardised residuals against the standardised predicted values in a scatter-plot graph and visually examined, as recommended by Field (2009).

3. Independence of residuals

The residuals should be uncorrelated from each other since the issue of autocorrelation may occur from the dependency between consecutive residuals (Field 2009; Levine et al. 2008). Durbin-Watson statistic, which measures each residual correlation with the successive residual in the immediate time period following the time period examined, can be used to test the existence of autocorrelation (Field 2009; Levine et al. 2008).

Durbin-Watson test was used in this study to detect serial correlations between the residuals. A value substantially greater or less than 2 may indicate a serial correlation issue (Field 2009). This benchmark was used to detect correlation issues between residuals.

4. Normally distributed residuals

The residuals in the model are assumed to be random and normally distributed (Field 2009). The residuals distribution should not be extremely different from the normal distribution to ensure robustness of the regression models developed (Field 2009; Levine et al. 2008). Modest departure of the residuals from normality is acceptable (Levine et al.
Residuals derived from each regression in this study were plotted on histograms and examined visually against the normal distribution curve to assess the residuals normality.

3.10.2 Evaluating the predictive ability and comparative strength of the models

The data sample is separated into two sub-samples, which are the *within sample* and the *holdout sample*. The within sample is used to develop the regression models and hypotheses testing while the holdout sample is used to validate these models. This approach is consistent with Chotkunakitti (2005), Stammerjohan and Nassiripour (2001) and Supriyadi (1998).

The F-statistics, Pearson’s correlation coefficient, Durbin-Watson statistics and the level of significance arising from the regressions are used to investigate and test the predictive ability of each individual regression models. The Durbin-Watson statistics were used to detect serial correlations between the residuals. If the Durbin-Watson value is substantially more or lower than 2, it may imply a serial correlation issue (Field 2009). The t-statistics are used to test the significant contribution from each predictor to the regression model. When conducting the linear regressions, the cases are excluded listwise to deal with missing data and when assessing and testing Pearson’s correlation coefficients between two variables, the cases are excluded pairwise.

The coefficient of determination (adjusted $R^2$) measures the strength of the relationships between the dependent variable and the predictors in the prediction model by indicating the proportion of the variance in the dependent variable statistically explained by the independent variables in the regression model (Greenberg et al. 1986; Jordan et al. 2007; McMurray 2008). It indicates the goodness-of-fit and also the accuracy of the regression models (Cooper and Emory 1995). The higher is the adjusted $R^2$ coefficient, the stronger is the explanatory powers or predictive ability of the model (Field 2009). The adjusted $R^2$ is used to evaluate and compare the predictive abilities or strength of each model and
provide the answer to hypothesis 6. This approach is consistent with prior studies (such as Al-Attar and Hussain 2004; Barth et al. 2001; Cheng and Hollie 2008; Chotkunakitti 2005; Ebaid 2011; Habib 2010; Jordan et al. 2007; McBeth 1993; Murdoch and Krause 1989, 1990; Quirin et al. 1999; Stammerjohan and Nassiripour 2001; Yoder 2006).

As recommended by Coolican (1990, p.174), the significance of the statistical test results based on the probability p is reported in three ways: (i) if 0.01 < p < 0.05, report as significant, (ii) if 0.001 < p < 0.01, then reported as highly significant and (iii) if p < 0.001, reported as very highly significant.

3.10.3 Validation tests
External validity refers to the generalisability of the causal relationship established across different settings, people or time (Lincoln and Guba 1985). Two methods were adopted to cross validate the models as follows:

1. The adjusted $R^2$ derived from SPSS is criticized for being unable to predict the fit of the regression model to different observations derived from the same population (Field 2009). Stein’s formula provides an alternative adjusted $R^2$ that can be used to examine the cross validity of the regression model as follows (Field 2009; Stevens 2002):

$$\text{Adjusted } R^2 = 1 - \left[ \left( \frac{n - 1}{n - k - 1} \right) \left( \frac{n - 2}{n - k - 2} \right) \left( \frac{n + 1}{n} \right) \right] \left( 1 - R^2 \right)$$

Where,
n is the number of cases;
k is the number of predictors and
$R^2$ is the unadjusted $R^2$ value derived from SPSS, which is found in the regression model summary.
If Stein’s alternative adjusted $R^2$ is consistent or similar to the one derived from SPSS, then the cross validity strength of this model is deemed good (Field 2009). This approach is acceptable to cross validate a model (Field 2009). Stein’s formula was used to compute an alternative adjusted $R^2$ and this was compared to the one derived from SPSS to assess the cross validity of the regression models.

2. The prediction models were also validated using the holdout sample. The regression models developed from the within sample was used to predict operating cash flows and then compared them with the actual operating cash flows from the holdout sample. Significance tests were conducted on Pearson’s correlation coefficients between the predicted operating cash flows and the actual operating cash flows from the holdout sample and the coefficients of determinations (adjusted $R^2$) derived from this comparison were also examined. This approach is consistent with Chotkunakitti (2005), Stammerjohan and Nassiripour (2001) and Supriyadi (1998).

Additional to these two validation tests, the residual analyses described in section 3.10.1 are conducted to ascertain that the four main regression assumptions are not violated. This will ensure that the regression results are valid and inferences made from conducting the regression analysis on the sample are appropriately generalisable to the population, as recommended by Field (2009) and Levine et al. (2008).

### 3.11 Data Collection

The previous section 3.10 described the statistical methods used to test the hypotheses. This section describes the methods used for sample collection and arrangement to test the prediction models. The target population is described in section 3.11.1, the sampling methods utilised are discussed in section 3.11.2, the secondary sources for data collection and the test period are examined in section 3.11.3 and the procedures used to pool and arrange the data are discussed in section 3.11.4.
3.11.1 Target population

Population relates to “the entire group of people, events, or things” in which the researcher seeks to examine (Sekaran 2000, p.297). The manufacturing sector is a key sector within the Malaysian economy, accounting for an estimated 25.6% of Malaysia’s Gross Domestic Product in 2008 (Department of Statistics Malaysia 2011). The targeted population for this study were all the companies classified within the Industrial Product manufacturing sector listed on Bursa Malaysia. There are currently 263 of such firms listed on Bursa Malaysia (Bursa Malaysia 2010).

3.11.2 Sampling methods

The purpose of sampling is to obtain a small collection of units or cases from which the researcher can analyse and derive a generalisation about the population (Neuman 2006). The firms selected for this study were from the entire population (263 firms) of listed Malaysian companies categorised within the “Industrial Products” manufacturing sector by Bursa Malaysia. The entire population is targeted to provide a sufficient number of companies for this study since there are not many of such companies.

Consistent with prior research (Barth et al. 2001; Chotkunakitti 2001; Yang 2000) the criteria used to select the companies were as follows:

a. 12 months annual report ending 31st December to ensure consistency of financial period for all sampled firms and
b. At least seven consecutive years to enable sufficient data for the regression models.

Companies that do not meet these criteria were excluded from the study. Companies that changed their financial year-end during the period studied or suspended from listing pending restructuring or delisting (classified as PN17 by Bursa Malaysia) were also excluded. Only those companies that have the complete relevant accounting data (such as accruals, operating cash flows and earnings) were included.
The accounting data for all companies selected within the testing period were pooled and analysed such that a firm-year observation represents a case. Following Al-Attar and Hussain (2004), all companies do not need to have data across the entire period examined to prevent bias from survivorship. The number of companies is acceptable to vary every year since not all the companies exist throughout the period examined. This approach is consistent with previous studies (Chotkunakitti 2005; Haw et al. 2001; Penham and Yehuda 2009). The research period and matching years to pool the secondary accounting data are further elaborated in sections 3.11.3 and 3.11.4.

3.11.3 Secondary sources and research period
Secondary data is data that has been gathered and recorded previously by another party (Zikmund 2000). This data is usually historically collected and require minimal access to the respondents or subjects (Zikmund 2000). The use of secondary sources of data, which can include both quantitative and qualitative data, is acceptable for explanatory research (Neuman 2006; Saunders et al. 2003).

Secondary data is commonly used in testing theory within the accounting and finance areas (Chotkunakitti 2005). Most prior research, such as Al-Attar and Hussain (2004), Barth et al. (2001), Chotkunakitti (2005), Ebaid (2011), Farshadfar et al. (2008) and Hollister et al. (2008), Waldron and Jordan (2010), have used secondary sources comprising of accounting data when investigating the relevance of accounting information in operating cash flows prediction studies. Consistent with prior studies, data collected for this study was accounting data mainly derived from secondary sources, which were the published annual financial statements of industrial products manufacturing companies listed on Bursa Malaysia. These annual financial statements were obtained from the website of Bursa Malaysia.

The accounting data for all the companies were collected for a period of 11 years from 1999 to 2009. The sample was partitioned into two subsamples, which are the within sample and the holdout sample. The within sample comprised of accounting data for the period from 1999 to 2008 while the holdout sample was from the year 2009. The within
sample was used to develop the regression models and conduct hypotheses testing. The holdout sample was used to evaluate the predictive ability and the validity of the regression models that were developed from the within sample. This approach is consistent with Chotkunakitti (2005) and Stammerjohan and Nassiripour (2001).

The research period from 1999 to 2009 undertaken for this study is acceptable. FRS 107, which required the publication of cash flow statement in Malaysia, was only mandatory in 1999 (Ng 2006) and there are limited cash flows data available prior to that year. The research period ended in the year 2009 since this specific year has the latest available annual statement for the purpose of this study. The research period for this study covered a stable economic period. It avoids inferences from the Asian financial crisis, which peaked during 1997 and 1998, when most organisations are negatively financially affected or in distress (Sloman 2000). It also avoided the change in the financial reporting regime when the MASB was created in 1997.

The length of 11 years for the research period examined in this study is also acceptable. Prior studies have examined differing length of research periods, ranging from 2 years to 50 years. The research period is consistent with Al-Attar et al. (2008) and Waldron and Jordan (2010) while exceeding other prior studies, such as Al-Attar and Hussain (2004), Arthur and Chuang (2006); Chotkunakitti (2005), Ebaid (2011), Jordan et al. (2007), Quirin et al. (1999), Stammerjohan and Nassiripour (2001) and Supriyadi (1998). The length of research period for some prior studies are summarised in table 3.4.
Table 3.4  Length of research period examined by some prior studies

<table>
<thead>
<tr>
<th>Study</th>
<th>Length of period tested (Years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jordan et al. (2007)</td>
<td>2</td>
</tr>
<tr>
<td>Quirin, O’Bryan, Wilcox and Berry (1999); Supriyadi (1998)</td>
<td>8</td>
</tr>
<tr>
<td>Chotkunakitti (2005); Ebaid (2011)</td>
<td>9</td>
</tr>
<tr>
<td>Al-Attar and Hussain (2004); Barth et al. (2001); Stammerjohan and Nassiripour (2001)</td>
<td>10</td>
</tr>
<tr>
<td>Al-Attar et al. (2008); Waldron and Jordan (2010)</td>
<td>11</td>
</tr>
<tr>
<td>Farshadfar et al. (2008)</td>
<td>13</td>
</tr>
<tr>
<td>Cheng and Hollie (2008); Yoder (2006)</td>
<td>16</td>
</tr>
<tr>
<td>Greenberg et al. (1986)</td>
<td>20</td>
</tr>
<tr>
<td>Dechow et al. (1998)</td>
<td>30</td>
</tr>
<tr>
<td>Finger (1994)</td>
<td>50</td>
</tr>
</tbody>
</table>

Source: Summarised from prior studies.

The use of annual data from published financial statements is acceptable and consistent with prior studies (such as Al-Attar and Hussain 2004; Barth et al. 2001; Chotkunakitti 2005; Ebaid 2011; Farshadfar et al. 2008; Hollister et al. 2008; Waldron and Jordan 2010; Yoder 2006). These annual financial statements were audited, which enhanced the reliability of the accounting information. Quarterly financial announcements are unsuitable since these announcements have insufficient information as only quarterly earnings are reported and no cash flow statement or balance sheet is published. Furthermore, such accounting information is unaudited, which reduces the reliability of the information. The earnings and EBITDA data were collected from the annual income statement and the relevant notes in the financial statements while the operating cash flows data were collected from the cash flow statement. Other relevant information was collected from the balance sheet.
3.11.4 Data preparation

This section describes the methods used to prepare and arrange the data prior to conducting the regression analysis. The procedures used to pool and arrange the data are described in section 3.11.4.1. The procedures used to deal with univariate and multivariate outliers are described in section 3.11.4.2 and the normality tests conducted on the sample are examined in section 3.11.4.3.

3.11.4.1 Data arrangement

The sample accounting data for all the companies were collected for the period from 1999 to 2009, as described in section 3.11.3. This sample was partitioned into two subsamples; the within sample, which is accounting data collected for the period from 1999 to 2008 and the holdout sample, which is accounting data for the year 2009. The accounting data was pooled such that one firm corresponding to one year is a firm-year observation that represents a case, which is consistent with prior studies such as Al-Attar and Hussain (2004), Barth et al. (2001), Chotkunakitti (2005) and Stammerjohan and Nassiripour (2001). This section describes the data arrangement when pooling and matching the data for the within sample and the holdout sample.

The within sample was used for the regression model development and hypotheses testing. The data used for the dependent variable was pooled for the period from 2000 to 2008. Consistent with Barth et al. (2001) and Chotkunakitti (2005), all the regressions required at least one lagged year as predictor. Hence, for the predictors, the data was pooled for the period from 1999 to 2007, which ensures that there is at least one lagged year predictor in the model. For the one year-lag predictors, it was pooled from 1999 to 2007. For the two years-lag predictors, it was pooled from 1999 to 2006 while for the three years-lag predictors, it was pooled from 1999 to 2005. Due to limited data available, the year 2000 has only one matching lagged year (1999) while the year 2001 has only two matching lagged years (2000 and 1999), which was acceptable since there was at least one year lagged variable as predictor.
The cases were excluded listwise to deal with missing data to ensure that for each case there was adequate information for the variables when conducting the regression. When assessing and testing Pearson’s correlation coefficient between two variables, the cases were excluded pairwise when there is missing data to ensure there is corresponding matching variable when conducting the correlations.

The data arrangement for the within sample is summarized in Table 3.5.

![Table 3.5](image)

For the validation tests on the robustness of the prediction models, the accounting data for the independent variables were collected from the year 2008 for the one year lagged predictor, from the year 2007 for the two years lagged predictor and from the year 2006 for the three years lagged predictor. Using the regression models, operating cash flows were predicted for the year 2009 from these data. The predicted operating cash flows for the year 2009 were then compared and examined against the actual operating cash flows for the year 2009 (the holdout sample). Table 3.6 illustrates the matching years for pooling data to predict the operating cash flows for the year 2009.
Table 3.6  Matching years for pooling data to predict future operating cash flows

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Independent variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prediction Year</td>
<td>Lagged one year (t-1)</td>
</tr>
</tbody>
</table>

Source: Developed for this study.

3.11.4.2  Outliers
Outliers are unusual values that have large influence on the regression results (Keller and Warrack 2003). Outliers can be identified by computing the Z-score for each case and if it exceeds the absolute value of 3.29 (p<0.001), it is a potential outlier (Manning and Munro 2006, p.53).

Each variable was checked individually for univariate outliers. Consistent with Barth et al. (2001) and Chotkunakitti (2005), these extreme outliers with computed Z-scores exceeding the absolute value of 3.29 (p<0.001) were removed to eliminate their effects.

Multivariate outliers were identified by computing the Mahalanobis distance for each case. If it exceeds a critical chi-square value (p<0.001) with degrees of freedom equivalent to the number of independent variables, that case is deemed a multivariate outlier (Manning and Munro 2006, p.55) and removed.

3.11.4.3  Normality tests
The lack of normality in the sample data can cause biasness in the results from the parametric tests (Field 2009). For example, Pearson’s correlation coefficient is a parametric statistic measuring the relationship between two variables and for the parametric test on this statistic to be valid, the sample data has to be normally distributed and interval data used for both variables (Field 2009). If the sample normality assumptions are violated, the results can be biased when testing the significance of the regression coefficients using the t-statistic (Field 2009; Wilcox 2005).
Histograms can be developed from the data and visually inspected against the normal distribution curve to evaluate normality (Field 2009; Manning and Munro 2006). Additionally, skew and kurtosis values can be computed and then used to evaluate normality (Field 2009; Manning and Munro 2006). These values can be converted to a Z-score by dividing the skew value and kurtosis value by the skew standard error and the kurtosis standard error respectively for each variable (Field 2009). If the Z-score exceeds an absolute value of 3.29 (p<0.01) for samples exceeding 300, the skew (or kurtosis) level is significant (Tabachnick and Fidell 2001).

Both criteria were used in the normality assessment of the sample data. Histograms were constructed from the firm-year distributions corresponding to each variable and visually inspected for normality against the normal distribution curve. The skew and kurtosis values were also computed and converted to the Z-scores and then compared against the benchmark value of 3.29, as recommended by Tabachnick and Fidell (2001).

3.11.5 Descriptive statistics
The previous section examined the procedures used for data arrangement and preparation. This section examines the descriptive statistics used to analyse the pooled sample characteristics for the regression variables.

The mean, minimum, maximum and the standard deviations for the pooled sample are measured for the unscaled and scaled observation for each variable. The variable is scaled by using average total assets, which is computed as opening plus closing total assets divided by two. This approach is consistent with Barth et al. (2001).

3.11.6 Correlation evaluation
The association between the dependent and the independent variables should be evaluated prior to conducting the regression to ensure that there is a relationship between the variables (Collins and Hussey 2003). However, for the regression model to be generalisable, two or more of the predictors should not have a perfect linear relationship (Field 2009). The problem of multcollinearity occurs when there is a strong correlation
between two or more of the predictors, making it difficult to evaluate the contribution of each variable to the regression model (Field, 2009). Multicollinearity exists if the correlation coefficient exceeds 0.90 for paired predictors (Field 2009; Hair, Anderson and Tatham, Black 1998).

Correlations between the variables were conducted and Pearson correlation coefficient was used to assess the direction and the size of the association between the variables in this study. The potential multicollinearity problems were detected by evaluating the correlation coefficients between the predictors in the regression model against the benchmark of 0.9 advocated by Field (2009) and Hair et al. (1998).

3.12 Research Validity, Reliability and Objectivity

A quantitative researcher must address the criteria of internal validity, external validity, reliability and objectivity in the research to ensure credibility and objectivity in the findings (Lincoln and Guba 1985). Quantitative researchers seek to achieve these criteria by emphasising on the need for objectivity when conducting the research (Neuman 2006). The research methods selected should be standardised, data analysis numerical based and statistically inclined and researcher involvement is minimized to enable the study to be value free, replicable and generalisable across different settings (Neuman 2006).

This study aimed to meet the four main criteria recommended by Lincoln and Guba (1985) to reduce biasness and enhance the objectivity of the research. The internal validity criteria is examined in section 3.12.1, the external validity criteria is evaluated in section 3.12.2, the reliability criteria is examined in section 3.12.3 and the objectivity criteria is evaluated in section 3.12.4.

3.12.1 Internal validity

Internal validity refers to the cause-effect relationship between variables, which is achieved by establishing the existence of a causal relationship between a dependent
variable and independent variable(s) through hypothesis testing using replicable standardized techniques (Lincoln and Guba 1985).

This research developed regression models using replicable statistical techniques to test the hypotheses in establishing the causal relationship significance between the dependent variables (current operating cash flows as proxy for future operating cash flows) and the predictor variables (past earnings, operating cash flows, accruals and EBITDA). The approach adopted for this study is coherent with the recommendation by Lincoln and Guba (1985). The internal validity of this study is appropriately addressed.

### 3.12.2 External validity

This refers to the generalisability of the causal relationship established across different settings, people or time (Lincoln and Guba 1985).

The validity of this study was tested by using two methods, as described in section 3.10.3. For the first method, following the recommendations by Stevens (2002) and Field (2009), an alternative adjusted $R^2$ is computed using Stein’s formula and compared with the adjusted $R^2$ derived from SPSS. The cross validity is acceptable if the alternative adjusted $R^2$ is consistent with the one derived from SPSS (Field 2009). For the second method, a holdout sample was used to validate and evaluate the robustness of the prediction models developed.

Additionally, the research period examined for this study covered a stable economic period from year 1999 to 2009. This excluded the period in which the Asian financial crisis occurred between 1997 and 1998. These averted the repercussions from the financial crisis, which is a non-recurring event, and enabled better generalisation for the future. The research period of 11 years is adequate for this study as it is consistent with Al-Attar et al. (2008) and exceeds some prior studies, such as Al-Attar and Hussain (2004), Arthur and Chuang (2006), Chotkunakitti (2005), Ebaid (2011), Jordan et al. (2007) and Quirin et al. (1999), Stammerjohan and Nassiripour (2001) and Supriyadi (1998).
3.12.3 Reliability
This refers to the consistency of results when applying the same or equivalent instrument to measure the same variable (Lincoln and Guba 1985). Reliability is obtained in the easiest manner when the measure is accurate and observable (Neuman 2006, p.197). This can be achieved by replicable tests, careful measurement and assessment processes (Lincoln and Guba 1985).

This research used numerical financial data from audited published financial statements. All listed companies in Malaysia are required by the Companies Act 1965 to follow the generally accepted accounting principles and the MASB accounting standards when preparing the annual financial statements. The secondary accounting data collected for this study is reliable as they are audited and prepared on accrual and cash accounting basis in accordance to the MASB accounting standards. The linear regression models were developed and significance testing conducted in accordance to standardised and reproducible statistical techniques. The reliability of this research is appropriately addressed.

3.12.4 Objectivity
This refers to the factual representation of the data to reality, which is not influenced by the personal involvement of the researcher (Lincoln and Guba 1985). This can be achieved when multiple observers jointly agree with the same findings or use research methodology that is value free and absence of human shortcomings (Lincoln and Guba 1985). In quantitative research, the human factor can be eliminated or minimised by following standardised and replicable methodological procedures, using numerical measurements and conducting statistical analysis (Neuman 2006).

This research adopted quantitative research methodology, which is aligned with the positivism paradigm, to develop regression models using standardised and reproducible statistical techniques when testing hypotheses. Secondary sources of numerical accounting data were derived from published audited financial statements for this study. This approach is coherent with the recommendations by Lincoln and Guba (1985) and
Neuman (2006) in ensuring the research is free from biasness. The objectivity of this research is adequately addressed.

3.13 Ethical Considerations

Ethics in research refer to the code of behaviour that is appropriate when conducting research (Saunders et al. 2003, p.129). This research seeks to compare the relative abilities of accrual accounting and cash accounting in predicting future cash flows. The research topic is well researched in various parts of the world and is not expected to be sensitive.

A key ethical consideration is respecting the privacy of the research participants, confidentiality of information and informed consent obtained from those participating (Saunders et al. 2003). Data were collected from secondary sources, which were the published financial statements for the manufacturing companies listed on the Malaysian stock exchange, Bursa Malaysia and hypotheses testing were conducted using standardised statistical techniques. The annual financial statements were downloaded from the website of Bursa Malaysia, which are easily available and accessible to the public. No participants were required to participate in this research or divulge confidential information. The ethical implications for this research are very minimal and acceptable.

3.14 Conclusion

This research adopted the positivist paradigm in approaching the research. This was most suitable as this study aimed to use quantitative methods when testing hypotheses. Hypothesis testing were conducted using replicable standardized statistical techniques, numerical based data and careful measurement and assessment processes. Causal relationships between the dependent variables (current operating cash flows acting as proxy for future operating cash flows) and predictor variables (past earnings, accruals, operating cash flows or EBITDA) were developed in the form of linear regression models to test the hypotheses. The correlation coefficient (r) and goodness-of-fit (adjusted R²) were used to evaluate the predictive ability of the models.
The data was obtained from secondary sources, which were the published audited annual financial statements. The research period adequately covered for the period of 11 years from 1999 to 2009 and exceeded the period examined by some prior studies. Sample was selected from the public listed industrial products manufacturing companies classified within the Industrial Products sector by Bursa Malaysia. The validity, reliability and objectivity of this research were adequately addressed. This ensured that the findings are value free and credible.

The next chapter examines and analyses the data collected using the methods described in this chapter.
CHAPTER 4

Data Analysis

4.1 Introduction

Chapter 3 described and justified the research design, approach, methodology and methods to test the hypotheses developed from chapter 2. This chapter aims to present the patterns and summaries of the empirical results from conducting the regressions and hypotheses testing. It mainly analyses and presents the data collected and the statistical results. The conclusions and implications from this data analysis in the context of the relevant extant literature examined in chapter 2 are discussed in the following chapter 5.

This chapter has 8 sections. The structure of this chapter is introduced in section 4.1. The regression models developed from the previous chapter are summarised in section 4.2. The selection and collection for the sample is described in section 4.3 while the data preparation, dealing with outliers, normality and multicollinearity tests for the sample are discussed in section 4.4. The descriptive characteristics for the sample are reported in section 4.5 while the correlations between the variables are examined in section 4.6. The results from conducting the regressions, hypotheses testing, comparison of the predictive abilities for each model and cross validation tests of the models are examined in section 4.7. The chapter is concluded in section 4.8.

The outline of this structure is illustrated in figure 4.1
Figure 4.1 Chapter 4 Structure: Data Analysis

- 4.1 Introduction
- 4.2 Linear Regression Models
- 4.3 Sample Selection
- 4.4 Data Preparation
- 4.5 Descriptive Statistics Analysis
- 4.6 Correlation Evaluation
- 4.7 Regression Analysis
- 4.8 Conclusion

Source: Developed for this study.
4.2 Linear Regression Models

The regression models as proxy for the prediction model, as developed in section 3.5, consist of the dependent variable, which are the operating cash flows and the predictors, which are past earnings, operating cash flows, accruals and EBITDA. The predictors are lagged up to a maximum of three years.

The generic regression model takes the form of:

\[ Y_t = a_0 + a_1 X_{t-1} + a_2 X_{t-2} + \ldots + a_i X_{t-i} + \varepsilon \]

Where \( Y_t \) is the outcome or predicted variable for the current year \( t \)

\( X_{t-i} \) is the predictor variables,

\( i \) is the number of years lagged from year \( t \), which is one, two, or three years,

\( a_i \) is the regression coefficient associated with the predictor variable,

\( a_0 \) is the value of the outcome when the predictor is zero and \( \varepsilon \) captures omitted factors (the error terms).

These univariate and multivariate regression models developed for this study are summarized in table 4.1.
<table>
<thead>
<tr>
<th>Regression Model</th>
<th>No. of lagged years</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Earnings Model</strong></td>
<td></td>
</tr>
<tr>
<td>$\text{CFO}<em>t = b_0 + b_1 \text{EARN}</em>{t-1} + \rho$</td>
<td>One year-lag</td>
</tr>
<tr>
<td>$\text{CFO}<em>t = b_0 + b_1 \text{EARN}</em>{t-1} + b_2 \text{EARN}_{t-2} + \rho$</td>
<td>Two years-lag</td>
</tr>
<tr>
<td>$\text{CFO}<em>t = b_0 + b_1 \text{EARN}</em>{t-1} + b_2 \text{EARN}<em>{t-2} + b_3 \text{EARN}</em>{t-3} + \rho$</td>
<td>Three years-lag</td>
</tr>
<tr>
<td><strong>Operating Cash flows Model</strong></td>
<td></td>
</tr>
<tr>
<td>$\text{CFO}<em>t = c_0 + c_1 \text{CFO}</em>{t-1} + \rho$</td>
<td>One year-lag</td>
</tr>
<tr>
<td>$\text{CFO}<em>t = c_0 + c_1 \text{CFO}</em>{t-1} + c_2 \text{CFO}_{t-2} + \rho$</td>
<td>Two years-lag</td>
</tr>
<tr>
<td>$\text{CFO}<em>t = c_0 + c_1 \text{CFO}</em>{t-1} + c_2 \text{CFO}<em>{t-2} + c_3 \text{CFO}</em>{t-3} + \rho$</td>
<td>Three years-lag</td>
</tr>
<tr>
<td><strong>Operating Cash Flows and Aggregated Accruals Model</strong></td>
<td></td>
</tr>
<tr>
<td>$\text{CFO}<em>t = d_0 + d_1 \text{CFO}</em>{t-1} + d_2 \text{ACCR}_{t-1} + \rho$</td>
<td>One year-lag</td>
</tr>
<tr>
<td>$\text{CFO}<em>t = d_0 + d_1 \text{CFO}</em>{t-1} + d_2 \text{CFO}<em>{t-2} + d_3 \text{ACCR}</em>{t-1} + d_4 \text{ACCR}_{t-2} + \rho$</td>
<td>Two years-lag</td>
</tr>
<tr>
<td>$\text{CFO}<em>t = d_0 + d_1 \text{CFO}</em>{t-1} + d_2 \text{CFO}<em>{t-2} + d_3 \text{CFO}</em>{t-3} + d_4 \text{ACCR}_{t-1} + \rho$</td>
<td>Three years-lag</td>
</tr>
<tr>
<td><strong>Operating Cash flows and Disaggregated Accrual Components Model</strong></td>
<td></td>
</tr>
<tr>
<td>$\text{CFO}<em>t = e_0 + e_1 \text{CFO}</em>{t-1} + e_2 \Delta \text{AR}<em>{t-1} + e_3 \Delta \text{AP}</em>{t-1} + e_4 \Delta \text{INV}<em>{t-1} + e_5 \Delta \text{OTH}</em>{t-1} + e_6 \text{DEPRM}_{t-1} + \rho$</td>
<td>One year-lag</td>
</tr>
<tr>
<td>$\text{CFO}<em>t = e_0 + e_1 \text{CFO}</em>{t-1} + e_2 \text{CFO}<em>{t-2} + e_3 \Delta \text{AR}</em>{t-1} + e_4 \Delta \text{AP}<em>{t-2} + e_5 \Delta \text{INV}</em>{t-1} + e_6 \text{DEPRM}_{t-2} + \rho$</td>
<td>Two years-lag</td>
</tr>
<tr>
<td>$\text{CFO}<em>t = e_0 + e_1 \text{CFO}</em>{t-1} + e_2 \text{CFO}<em>{t-2} + e_3 \text{CFO}</em>{t-3} + e_4 \Delta \text{AR}<em>{t-1} + e_5 \Delta \text{AP}</em>{t-2} + e_6 \text{DEPRM}<em>{t-3} + e_7 \Delta \text{AR}</em>{t-1} + e_8 \Delta \text{AP}<em>{t-2} + e_9 \Delta \text{AP}</em>{t-3} + e_{10} \Delta \text{INV}<em>{t-1} + e</em>{11} \Delta \text{INV}<em>{t-2} + e</em>{12} \Delta \text{INV}<em>{t-3} + e</em>{13} \Delta \text{DEPRM}<em>{t-1} + e</em>{14} \Delta \text{DEPRM}<em>{t-2} + e</em>{15} \Delta \text{DEPRM}<em>{t-3} + e</em>{16} \text{DEPRM}<em>{t-1} + e</em>{17} \Delta \text{OTH}<em>{t-1} + e</em>{18} \Delta \text{OTH}<em>{t-2} + e</em>{19} \Delta \text{OTH}_{t-3} + \rho$</td>
<td>Three years-lag</td>
</tr>
<tr>
<td><strong>EBITDA Model</strong></td>
<td></td>
</tr>
<tr>
<td>$\text{CFO}<em>t = f_0 + f_1 \text{EBITDA}</em>{t-1} + \rho$</td>
<td>One year-lag</td>
</tr>
<tr>
<td>$\text{CFO}<em>t = f_0 + f_1 \text{EBITDA}</em>{t-1} + f_2 \text{EBITDA}_{t-2} + \rho$</td>
<td>Two years-lag</td>
</tr>
<tr>
<td>$\text{CFO}<em>t = f_0 + f_1 \text{EBITDA}</em>{t-1} + f_2 \text{EBITDA}<em>{t-2} + f_3 \text{EBITDA}</em>{t-3} + \rho$</td>
<td>Three years-lag</td>
</tr>
</tbody>
</table>

Source: Summarised from section 3.9 in Chapter 3 of this study.
4.3 Sample Selection

This section describes the selection and collection of the sample required to conduct this study by following the data collection approach and techniques outlined in section 3.11.

The sample was selected from the entire population (263 firms) of the listed manufacturing companies classified within the Industrial Products Manufacturing Sector by Bursa Malaysia. This is to provide sufficient number of companies for this study since there are not many of these companies in this category. The relevant accounting data for this study was extracted for 11 years from the annual reports sourced from Bursa Malaysia website for the period from 1999 to 2009. Consistent with prior studies (Anderson et al. 2007; Barth et al. 2001; Collins and Hribar 2002; Farshadfar et al. 2008), all the financial data were scaled by average total assets to eliminate size effects and reduce heteroskedasticity.

The criteria used in selecting the companies, as described in section 3.11.2, were:

a. 12 months annual report ending 31st December and
b. At least seven consecutive years to enable adequate data collection.

Additionally, firms that changed their financial year-end during the period studied or suspended from listing pending restructuring or delisting (classified as PN17 by Bursa Malaysia) were excluded. Only firms with complete relevant data (such as accruals, operating cash flows and earnings) were included.

The total number of companies selected that meet all these criteria is 97. If the population is less than 1000, the sampling ratio, which is the number of samples as a percentage of the population, should exceed 30% (Neuman 2006, p.241). Based on the population of 263, the sampling ratio for this study is 37%. The total number of firms for this study is acceptable as the sampling ratio exceeds the minimum size recommended by Neuman (2006). Table 4.2 summarised the number of firms selected for this study based on the defined criteria.
### Table 4.2  Total number of firms included in the study

<table>
<thead>
<tr>
<th>Description</th>
<th>Number of firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial number of firms (population)</td>
<td>263</td>
</tr>
<tr>
<td>Exclude:</td>
<td></td>
</tr>
<tr>
<td>i. Non-December year end</td>
<td>(110)</td>
</tr>
<tr>
<td>ii. Firms with less than 7 years data</td>
<td>(39)</td>
</tr>
<tr>
<td>iii. Incomplete data</td>
<td>(9)</td>
</tr>
<tr>
<td>iv. Suspended /under liquidation (PN17)</td>
<td>(8)</td>
</tr>
<tr>
<td><strong>Final number of firms</strong></td>
<td><strong>97</strong></td>
</tr>
</tbody>
</table>

Source: Based on data analysis.

### 4.4 Data Preparation

This section described the data arrangement and preparation prior to conducting the regressions, as discussed in section 3.11.4. The data arrangement is examined in section 4.4.1 while the procedures used to deal with outliers and normality tests on the sample data are examined in section 4.4.2.

#### 4.4.1 Data arrangement

The accounting data was collected for 11 years for the period from 1999 to 2009. The accounting data was pooled such that one firm corresponding to one year is a firm-year observation, which represents a case, as described in section 3.11.2. The total number of firm-years or cases for this study was 918 from pooling the accounting data of all the selected 97 firms.

Table 4.3 summarised the number of firms corresponding to each year.

### Table 4.3:  Number of firms corresponding to each year

<table>
<thead>
<tr>
<th>Year</th>
<th>1999</th>
<th>2000</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>2009</th>
<th>Total no. of firm-years</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of firms</td>
<td>46</td>
<td>54</td>
<td>72</td>
<td>77</td>
<td>87</td>
<td>97</td>
<td>97</td>
<td>97</td>
<td>97</td>
<td>97</td>
<td>97</td>
<td>918</td>
</tr>
</tbody>
</table>

Source: Based on data analysis.
The accounting data collected was partitioned into two subsamples; the within sample, which comprised of accounting data for the period from 1999 to 2008 and the holdout sample, which consisted of accounting data for the year 2009, as described in section 3.11.3. The within sample was used to develop the regression models and hypotheses testing. The holdout sample was used to examine the predictive ability and validity of the regression models. This approach is similar to Chotkunakitti (2005), Stammerjohan and Nassiripour (2001) and Supriyadi (1998).

The accounting data for the period from 1999 to 2008 were pooled and matched for the dependent and independent variables from the within sample, as described in section 3.11.4. For the dependent variable, the data was pooled for the period from 2000 to 2008, resulting in a total of 775 firm-years for this variable. For the one year-lag predictor, the data was pooled for the period from 1999 to 2007, which resulted in a total of 724 firm-years. For the two years-lag predictor, the data was pooled for the period from 1999 to 2006, which resulted in a total of 627 firm-years. For the three years-lag predictor, data was pooled for the period from 1999 to 2005, which resulted in a total of 530 firm-years. The matching years for pooling the data and the total firm-years for each variable are summarized in table 4.4.
Table 4.4  Matching years for pooling accounting data

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Independent variable</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Current year (t)</td>
</tr>
<tr>
<td></td>
<td>Lagged one year</td>
</tr>
<tr>
<td></td>
<td>Lagged two years</td>
</tr>
<tr>
<td></td>
<td>Lagged three years</td>
</tr>
<tr>
<td>Year t</td>
<td>No. of firms</td>
</tr>
<tr>
<td>2000</td>
<td>54</td>
</tr>
<tr>
<td>2001</td>
<td>72</td>
</tr>
<tr>
<td>2002</td>
<td>77</td>
</tr>
<tr>
<td>2003</td>
<td>87</td>
</tr>
<tr>
<td>2004</td>
<td>97</td>
</tr>
<tr>
<td>2005</td>
<td>97</td>
</tr>
<tr>
<td>2006</td>
<td>97</td>
</tr>
<tr>
<td>2007</td>
<td>97</td>
</tr>
<tr>
<td>2008</td>
<td>97</td>
</tr>
<tr>
<td>Total firm years</td>
<td>775</td>
</tr>
</tbody>
</table>

Source: Developed for this study.

4.4.2  Outliers and normality tests

Each variable was checked individually for univariate and multivariate outliers, as described in section 3.11.4.2. Any Z-score for each case (firm-year) exceeding the absolute value of 3.29 (p<0.001) is identified as a potential outlier (Manning and Munro 2006, p.53). Following Barth et al. (2001) and Chotkunakitti (2005), these outliers were removed to eliminate their effects.

The multivariate outlier was identified by calculating the Mahalanobis distance for each case (firm-year) and checked whether it exceeds a critical chi-square value (p<0.001) with degrees of freedom equivalent to the number of independent variables for each model. No multivariate outlier was identified as no case’s Mahalanobis distance exceeded the critical chi-square value.

Histograms were derived from the sample firm-years data for each variable and visually inspected against the normal distribution curve to evaluate the normality of the sample firm-years data, as recommended by Field (2009). Additionally, skew and kurtosis values
were computed and converted to a Z-score. For samples exceeding 300, if the Z-score exceeds an absolute value of 3.29 (p<0.01), the skew (or kurtosis) level is significant (Tabachnick and Fidell 2001), as described in section 3.11.4.3.

Visual inspection of the histograms for the firm-year distributions corresponding to each variable indicated normality of the sample data. These histograms are illustrated in Appendix A. The Z-score for skew and kurtosis for each variable was less than 3.29, indicating that the skewness and kurtosis was insignificant. These results are summarized in Appendix B.

The firm-year distributions (sample data) corresponding to each variable is acceptable as normal.

4.5 Descriptive Statistics Analysis
The results from using the descriptive statistics to analyse the characteristics of the pooled sample for the regression variables are examined in this section. The earnings (EARN), cash flow from operations (CFO), aggregated accruals (ACR) and EBITDA characteristics were examined initially, followed by the analysis of the disaggregated accrual components characteristics.

Table 4.5 presents the descriptive statistics of the secondary accounting data collected for the variables. It summarized the mean, minimum, maximum and the standard deviation from the regressions for both the unscaled and scaled (using average total assets) observations. Analysing table 4.5 revealed that the means of EARN, CFO and EBITDA were positive while the ACR mean was negative. This implied that the Malaysian firms selected for this study on average was profitable and has positive net cash flows arising from continuing business activities. These characteristics were consistent with Barth et al. (2001), Chotkunakitti (2005), Dechow, et al. (1998) and Murdoch and Krause (1989).

EBITDA mean has the highest value at RM41.7m (scaled=0.09). EARN mean at RM17.4m (scale=0.0359) is lower than CFO mean at RM28.11m (scaled=0.0507). This
is expected since EARN were reduced by depreciation and amortization expenses, which were non-cash expenses and hence, should be lower than CFO (Chotkunakitti 2005; Dechow et al. 1998). ACR has a negative mean at RM10.7m (scaled=-0.0259). ACR were computed as EARN less CFO. Since the EARN were lower than the CFO due to the depreciation and amortization expenses, this gave rise to the negative ACR. These were consistent with Barth et al. (2001), Chotkunakitti (2005), Dechow, et al. (1998) and Murdoch and Krause (1989).

The variability, which is measured by the standard deviation, of EARN at RM62.62m (scaled=0.0572) is the lowest compared to CFO at RM138.31m (scaled=0.0756), ACR at RM2.31b (scaled=0.0818) and EBITDA at RM91.20m (scaled=0.0745). This implied that EARN are more stable than CFO, ACR and EBITDA. These characteristics were similar with Dechow (1994) and Dechow et al. (1998).

Following Barth et al. (2001), the disaggregated accrual components were classified into two categories; current accruals and long term accruals. The current accruals consist of inventory changes (INV), accounts receivable changes (AR) and accounts payable changes (AP) and the long term accruals consist of depreciation and amortization expenses (DEPRM).

INV and AR have positive means while DEPRM and other accruals components (OTH) have negative means. The magnitude of the current accruals as measured by the means for INV at RM7.1m (scaled=0.0077) and AR at RM4.16 (scaled=0.0103) were lower than the long term accruals, DEPRM at –RM14.4m (scaled=-0.0359). The current accruals variability as measured by the standard deviation for INV at RM931.4m (scaled=0.0330) and AR at RM40.75m (scaled=0.0486) is higher than the long term accruals variability for DEPRM at RM23.8m (scaled=0.0175). These results were indicative that long term accruals (DEPRM) have higher contribution and more stable than current accruals, which were consistent with prior studies (Barth et al. 2001, Chotkunakitti 2005).
Concluding from this, the main characteristics of firms used for this study were consistent with some prior studies conducted in other countries (Barth et al. 2001; Chotkunakitti 2005; Dechow 1994; Dechow et al. 1994; Murdoch and Krause 1989).
Table 4.5   Descriptive statistics of unscaled and scaled variables: pooled sample (1999 to 2009)

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>UNSCALED (RM)</th>
<th>SCALED</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MEAN</td>
<td>MINIMUM</td>
</tr>
<tr>
<td>EARN</td>
<td>17,417,408</td>
<td>(444,964,000)</td>
</tr>
<tr>
<td>CFO</td>
<td>28,110,669</td>
<td>(2,190,852,000)</td>
</tr>
<tr>
<td>ACR</td>
<td>(10,710,090)</td>
<td>(1,849,845,000)</td>
</tr>
<tr>
<td>INV</td>
<td>7,105,557</td>
<td>(794,518,000)</td>
</tr>
<tr>
<td>DEPRM</td>
<td>(14,415,612)</td>
<td>(184,481,000)</td>
</tr>
<tr>
<td>AR</td>
<td>4,159,630</td>
<td>(567,862,000)</td>
</tr>
<tr>
<td>AP</td>
<td>(2,528,060)</td>
<td>(477,057,000)</td>
</tr>
<tr>
<td>OTH</td>
<td>(5,023,164)</td>
<td>(1,799,769,000)</td>
</tr>
<tr>
<td>EBITDA</td>
<td>41,729,797</td>
<td>(593,073,000)</td>
</tr>
</tbody>
</table>

Source: Secondary data analysed for this study.
4.6 Correlation Evaluation

The correlations between the variables were conducted to ascertain that there is a relationship between the dependent and the predictors (Collins and Hussey 2003), as described in section 3.11.6. Pearson’s correlation coefficient was used to measure the direction and the size of the association between the dependent and the predictors. The correlation coefficient was also used to detect multicollinearity between the predictors in each of the regression models. The problem of multicollinearity exists if Pearson’s correlations exceed the benchmark of 0.9, which was recommended by Field (2009) and Hair et al. (1998).

This section initially analysed the correlations between cash flows (CFO), earnings (EARN), aggregated accruals (ACR) and EBITDA, which are summarized in table 4.6. This is followed by an analysis on the correlations between operating cash flows and disaggregated accrual components, which are summarized in table 4.7.

Table 4.6 illustrated the correlations between operating cash flows, earnings, aggregated accruals and EBITDA. Analysing table 4.6 revealed that most of the correlations between current operating cash flows, earnings, and EBITDA were highly significant (p<0.01). Current operating cash flows (CFO\textsubscript{t}) were highly significantly and positively correlated with past cash flows (CFO\textsubscript{t-1}, CFO\textsubscript{t-2}, CFO\textsubscript{t-3}), past earnings (EARN\textsubscript{t-1}, EARN\textsubscript{t-2}, EARN\textsubscript{t-3}) and past EBITDA (EBITDA\textsubscript{t-1}, EBITDA\textsubscript{t-2}, EBITDA\textsubscript{t-3}) (p<0.01). These results were consistent with prior studies, such as Barth et al. (2001), Chotkunakitti (2005) and Dechow, et al. (1998). Current operating cash flows (CFO\textsubscript{t}) were highly significantly and negatively correlated with current accruals (ACR\textsubscript{t}) (p<0.01) while significantly and positively correlated with one year lagged aggregated accruals (ACR\textsubscript{t-1}) (p<0.05).

Both the correlations of earnings (ranged between 0.184 and 0.266) and EBITDA (ranged between 0.175 and 0.298) with current operating cash flows were higher than the correlations of past operating cash flows (ranged between 0.159 and 0.173) with current
operating cash flows. This may cause the explanatory powers of the earnings model and the EBITDA model stronger than the operating cash flows model.

Most of the predictors, which were past operating cash flows, earnings, aggregated accruals and EBITDA, were highly significantly autocorrelated with each other (p<0.01). However, there was no multicollinearity between these predictors as the magnitudes of the correlations were all less than 0.9, which was the threshold recommended by Hair et al (1998) and Field (2009) for multicollinearity to exist.

Table 4.7 summarised the correlation results between operating cash flows and the disaggregated accrual components. Analysing table 4.7 revealed that current operating cash flows (CFO), have significant correlations mainly with depreciation and amortization (DEPRM), inventory (INV) and accounts receivable (AR) (p<0.05) but no significant correlations with accounts payable (AP) and other accruals (OTH) (p>0.05). Similar to Barth et al. (2001), the significant correlations between current operating cash flows and past depreciation and amortization were negative, ranging between -0.097 and -0.110 (p<0.05).

Some of the predictors, which were past operating cash flows and individual disaggregated accrual components, were significantly autocorrelated with each other (p<0.05). However, no multicollinearity problem existed since the magnitudes of the correlations did not exceed the threshold of 0.9 recommended by Hair et al (1998) and Field (2009).

In conclusion, there were evidence of significant correlations between the dependent and the independent variables. Current operating cash flows were highly significant and positively correlated with earnings, operating cash flows and EBITDA as well as significantly correlated with aggregated accruals. The current operating cash flows correlations with past earnings and with past EBITDA were higher than with past operating cash flows. This may cause the predictive abilities of the earnings model or the EBITDA model stronger than the operating cash flows model. The predictors were also
significantly autocorrelated with each other, which was acceptable since there were no substantial correlations ($r < 0.9$) between the predictors that could cause multicollinearity issues. These variables were acceptable for the regression models to predict future operating cash flows.
Table 4.6 Correlation matrix for earnings (EARN), cash flow from operations (CFO), aggregated accruals (ACR) and EBITDA scaled by average total assets

<table>
<thead>
<tr>
<th>Variable</th>
<th>CFO</th>
<th>CFO t-1</th>
<th>CFO t-2</th>
<th>CFO t-3</th>
<th>EARN</th>
<th>EARN t-1</th>
<th>EARN t-2</th>
<th>EARN t-3</th>
<th>ACR</th>
<th>ACR t-1</th>
<th>ACR t-2</th>
<th>ACR t-3</th>
<th>EBITDA</th>
<th>EBITDA t-1</th>
<th>EBITDA t-2</th>
<th>EBITDA t-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>CFO t</td>
<td>1</td>
<td>0.173**</td>
<td>0.165**</td>
<td>0.159**</td>
<td>0.291**</td>
<td>0.266**</td>
<td>0.242**</td>
<td>0.184**</td>
<td>-0.562**</td>
<td>0.077*</td>
<td>0.003</td>
<td>0.033</td>
<td>0.321**</td>
<td>0.298**</td>
<td>0.255**</td>
<td>0.175**</td>
</tr>
<tr>
<td>CFO t-1</td>
<td>0.173**</td>
<td>1</td>
<td>0.204**</td>
<td>0.159**</td>
<td>0.292**</td>
<td>0.298**</td>
<td>0.246**</td>
<td>0.234**</td>
<td>0.077*</td>
<td>-0.569**</td>
<td>0.059</td>
<td>0.030</td>
<td>0.308**</td>
<td>0.307**</td>
<td>0.285**</td>
<td>0.258**</td>
</tr>
<tr>
<td>CFO t-2</td>
<td>0.165**</td>
<td>0.204**</td>
<td>1</td>
<td>0.222**</td>
<td>0.239**</td>
<td>0.285**</td>
<td>0.307**</td>
<td>0.261**</td>
<td>0.069</td>
<td>0.060</td>
<td>-0.559**</td>
<td>0.067</td>
<td>0.067</td>
<td>0.300**</td>
<td>0.306**</td>
<td>0.305**</td>
</tr>
<tr>
<td>CFO t-3</td>
<td>0.159**</td>
<td>0.159**</td>
<td>0.222**</td>
<td>1</td>
<td>0.167**</td>
<td>0.247**</td>
<td>0.283**</td>
<td>0.316**</td>
<td>0.023</td>
<td>0.076</td>
<td>0.035</td>
<td>-0.536**</td>
<td>0.207**</td>
<td>0.237**</td>
<td>0.309**</td>
<td></td>
</tr>
<tr>
<td>EARN t</td>
<td>0.291**</td>
<td>0.292**</td>
<td>0.239**</td>
<td>0.167**</td>
<td>1</td>
<td>0.597**</td>
<td>0.513**</td>
<td>0.424**</td>
<td>0.403**</td>
<td>0.174**</td>
<td>0.167**</td>
<td>0.180**</td>
<td>0.867**</td>
<td>0.564**</td>
<td>0.470**</td>
<td>0.374**</td>
</tr>
<tr>
<td>EARN t-1</td>
<td>0.266**</td>
<td>0.298**</td>
<td>0.285**</td>
<td>0.247**</td>
<td>0.597**</td>
<td>1</td>
<td>0.599**</td>
<td>0.499**</td>
<td>0.200**</td>
<td>0.399**</td>
<td>0.183**</td>
<td>0.527**</td>
<td>0.868**</td>
<td>0.563**</td>
<td>0.472**</td>
<td></td>
</tr>
<tr>
<td>EARN t-2</td>
<td>0.242**</td>
<td>0.264**</td>
<td>0.307**</td>
<td>0.238**</td>
<td>0.513**</td>
<td>0.599**</td>
<td>1</td>
<td>0.626**</td>
<td>0.172**</td>
<td>0.215**</td>
<td>0.395**</td>
<td>0.166**</td>
<td>0.458**</td>
<td>0.541**</td>
<td>0.871**</td>
<td>0.553**</td>
</tr>
<tr>
<td>EARN t-3</td>
<td>0.184**</td>
<td>0.234**</td>
<td>0.261**</td>
<td>0.316**</td>
<td>0.424**</td>
<td>0.499**</td>
<td>0.626**</td>
<td>1</td>
<td>0.135**</td>
<td>0.176**</td>
<td>0.224**</td>
<td>0.388**</td>
<td>0.348**</td>
<td>0.449**</td>
<td>0.547**</td>
<td>0.865**</td>
</tr>
<tr>
<td>ACR t</td>
<td>-0.562**</td>
<td>0.077*</td>
<td>0.069</td>
<td>0.023</td>
<td>0.403**</td>
<td>0.199**</td>
<td>0.172**</td>
<td>0.135**</td>
<td>1</td>
<td>0.120**</td>
<td>0.118**</td>
<td>0.110**</td>
<td>0.396**</td>
<td>0.199**</td>
<td>0.160**</td>
<td>0.153**</td>
</tr>
<tr>
<td>ACR t-1</td>
<td>0.077*</td>
<td>-0.569**</td>
<td>0.069</td>
<td>0.023</td>
<td>0.403**</td>
<td>0.199**</td>
<td>0.172**</td>
<td>0.135**</td>
<td>1</td>
<td>0.116**</td>
<td>0.115**</td>
<td>0.162**</td>
<td>0.404**</td>
<td>0.196**</td>
<td>0.152**</td>
<td></td>
</tr>
<tr>
<td>ACR t-2</td>
<td>0.003</td>
<td>0.0590</td>
<td>-0.559**</td>
<td>0.035</td>
<td>0.167**</td>
<td>0.183**</td>
<td>0.395**</td>
<td>0.224**</td>
<td>0.118**</td>
<td>0.116**</td>
<td>1</td>
<td>0.140**</td>
<td>0.132**</td>
<td>0.172**</td>
<td>0.400**</td>
<td>0.190**</td>
</tr>
<tr>
<td>ACR t-3</td>
<td>0.033</td>
<td>0.030</td>
<td>0.067</td>
<td>-0.536**</td>
<td>0.180**</td>
<td>0.151**</td>
<td>0.166**</td>
<td>0.388**</td>
<td>0.110**</td>
<td>0.115**</td>
<td>0.140**</td>
<td>1</td>
<td>0.147**</td>
<td>0.143**</td>
<td>0.176**</td>
<td>0.389**</td>
</tr>
<tr>
<td>EBITDA t</td>
<td>0.321**</td>
<td>0.308**</td>
<td>0.272**</td>
<td>0.207**</td>
<td>0.877**</td>
<td>0.527**</td>
<td>0.458**</td>
<td>0.348**</td>
<td>0.396**</td>
<td>0.162**</td>
<td>0.132**</td>
<td>0.147**</td>
<td>1</td>
<td>0.611**</td>
<td>0.503**</td>
<td>0.403**</td>
</tr>
<tr>
<td>EBITDA t-1</td>
<td>0.298**</td>
<td>0.307**</td>
<td>0.300**</td>
<td>0.239**</td>
<td>0.564**</td>
<td>0.868**</td>
<td>0.541**</td>
<td>0.440**</td>
<td>0.199**</td>
<td>0.404**</td>
<td>0.172**</td>
<td>0.143**</td>
<td>0.611**</td>
<td>1</td>
<td>0.611**</td>
<td>0.498**</td>
</tr>
<tr>
<td>EBITDA t-2</td>
<td>0.255**</td>
<td>0.285**</td>
<td>0.316**</td>
<td>0.308**</td>
<td>0.470**</td>
<td>0.563**</td>
<td>0.871**</td>
<td>0.547**</td>
<td>0.160**</td>
<td>0.196**</td>
<td>0.400**</td>
<td>0.176**</td>
<td>0.503**</td>
<td>0.611**</td>
<td>1</td>
<td>0.609**</td>
</tr>
<tr>
<td>EBITDA t-3</td>
<td>0.175**</td>
<td>0.258**</td>
<td>0.305**</td>
<td>0.324**</td>
<td>0.374**</td>
<td>0.472**</td>
<td>0.553**</td>
<td>0.865**</td>
<td>0.153**</td>
<td>0.152**</td>
<td>0.199**</td>
<td>0.389**</td>
<td>0.403**</td>
<td>0.498**</td>
<td>0.609**</td>
<td>1</td>
</tr>
</tbody>
</table>

Source: Summarised from correlation results.

* Correlation is significant at the 0.05 level (2-tailed)
** Correlation is significant at the 0.01 level (2-tailed)
Table 4.7

Correlation matrix for cash flow from operations (CFO) and disaggregated accrual components, which are

inventory changes (INV), accounts receivable changes (AR), accounts payable changes (AP), depreciation and amortization
(DEPRM) and other accruals changes (OTH), scaled by average total assets
Pearson Correlations
Variable

CFOt

CFOt-1

CFOt-2

CFOt-3

DEPRMt DEPRMt-1 DEPRMt-2 DEPRMt-3

CFOt

1

0.173**

0.165**

0.159**

-0.163**

-0.105**

-0.097*

CFOt-1

0.173**

1

0.204**

0.159**

-0.140**

-0.174**

CFOt-2

0.165**

0.204**

1

0.222**

-0.148**

0.159**

0.159**

0.222**

1

CFOt-3
DEPRMt

-0.163** -0.140** -0.148** -0.145**

INVt

INVt-2

INVt-3

ARt

ARt-1

ARt-2

ARt-3

APt

APt-1

APt-2

APt-3

OTHt

OTHt-1

OTHt-2

-0.110** -0.211** 0.101**

INVt-1

0.054

0.083

-0.244**

0.044

0.028

0.051

-0.055

-0.039

-0.055

-0.029

-0.031

0.011

0.024

0.046

-0.110**

-0.130**

0.074

0.081

0.053

-0.274**

0.07

0.03

0.029

-0.063

-0.053

-0.034

0.065

-0.016

0.005

0.059

-0.141**

-0.171**

-0.128**

0.055

0.081* -0.180** 0.104*

0.015

0.055

-0.272**

0.066

-0.034

0.057

-0.073

-0.018

0.096*

0.098*

0.026

0.015

-0.145**

-0.136**

-0.146**

-0.186**

0.097*

0.102*

1

0.864**

0.758**

0.686**

-0.009

-0.063

0.103** -0.180**

0.112** -0.158**
-0.044

0.025

0.032

-0.003

-0.243**

-0.047

-0.029

0.099*

-0.110**

0.014

-0.018

-0.009

-0.01

0.023

0.033

0.015

0.022

0.005

0.029

0.014

0.121** 0.132**
0.035

OTHt-3

0.029

0.021

-0.007

DEPRMt-1

-0.105** -0.174** -0.141** -0.136**

0.864**

1

0.860**

0.752**

0.014

0.003

-0.079

-0.05

0.001

-0.004

0.004

-0.003

0.018

0.014

0.034

0.034

-0.005

0.008

0.02

0.017

DEPRMt-2

-0.097*

-0.110** -0.171** -0.146**

0.758**

0.860**

1

0.859**

-0.001

0.028

-0.007

-0.083

-0.04

0.003

0.018

0.002

0.058

0.007

0.013

0.055

-0.051

-0.019

-0.006

0.018

DEPRMt-3

-0.110** -0.130** -0.128** -0.186**

0.686**

0.752**

0.859**

1

-0.036

0.036

-0.008

-0.014

-0.026

-0.024

0.041

-0.027

0.07

0.031

0.021

0.044

-0.022

-0.069

-0.02

0.002

-0.009

0.014

-0.001

-0.036

1

0.026

0.107**

0.005

0.038

0.004

-0.148**

-0.046

-0.034

-0.011

-0.01

0.012

-0.016

-0.009

0.026

1

0.086*

0.096*

0.015

-0.043

-0.130**

-0.022

-0.021

-0.004

-0.031

-0.023

0.003

1

0.065

0.04

-0.019

-0.062

-0.127**

-0.005

-0.055

0.005

-0.02

0.007

0.065

1

0.014

0.034

0.151** 0.140**

-0.026

0

-0.067

-0.135**

0.032

-0.071

0.007

-0.027

0.014

1

-0.047

0.092*

0.059

-0.379**

0.016

-0.037

-0.130**

-0.018

0.01

0.029

-0.009

0.034

-0.047

1

-0.054

0.068

0.003

-.371**

0.032

-0.037

-0.024

-0.022

0.026

0.021

0.092*

-0.054

1

-0.035

-0.022

0.031

-0.334**

0.025

0.015

-0.025

-0.027

-0.001

0.059

0.068

-0.035

1

-0.035

-0.049

0.015

0.037

-0.018

-0.032

0.003

-0.022

-0.035

1

-0.071

-0.007

0.084

-0.077*

-0.081*

-0.032

-0.05

-0.371**

0.031

-0.049

-0.071

1

-0.085*

-0.035

0.001

-0.083*

-0.046

-0.046

INVt

-0.211** 0.103**

INVt-1

0.101** -0.180**

INVt-2

0.054

0.074

INVt-3

0.083

0.081

0.055

0.097*

0.081*

0.102*

-0.063

0.003

0.028

0.036

-0.044

-0.079

-0.007

-0.008

-0.158**

-0.018

-0.05

-0.083

-0.014

-0.180** 0.112**
0.104*

0.107** 0.086*
0.005

0.096*

ARt

-0.244**

0.053

0.015

0.025

-0.009

0.001

-0.04

-0.026

0.141** 0.127**

ARt-1

0.044

-0.274**

0.055

0.032

-0.01

-0.004

0.003

-0.024

0.175** 0.160** 0.132**

ARt-2

0.028

0.07

-0.272**

-0.003

0.023

0.004

0.018

0.041

0.038
0.004

0.04

0.166** 0.178** 0.151**
0.015

0.127** 0.160** 0.166**

0.132** 0.178** 0.129**

ARt-3

0.051

0.03

0.066

-0.243**

0.033

-0.003

0.002

-0.027

APt

-0.055

0.029

-0.034

-0.047

0.015

0.018

0.058

0.07

APt-1

-0.039

-0.063

0.057

-0.029

0.022

0.014

0.007

0.031

-0.046 -0.130** -0.062

APt-2

-0.055

-0.053

-0.073

0.099*

0.005

0.034

0.013

0.021

-0.034

-0.022 -0.127** -0.067

0.032

-0.334**

0.015

-0.007

-0.085*

1

-0.102*

0.022

0.018

-0.05

-0.044

APt-3

-0.029

-0.034

-0.018

-0.110**

0.029

0.034

0.055

0.044

-0.011

-0.021

-0.005 -0.135** -0.130**

-0.037

0.025

-0.326**

0.084

-0.035

-0.102*

1

0.057

-0.015

-0.008

-0.047

OTHt

-0.031

0.065

0.096*

0.014

0.014

-0.005

-0.051

-0.022

-0.01

-0.004

-0.055

0.032

-0.018

-0.024

0.015

-0.113** -0.077*

0.001

0.022

0.057

1

-0.148** -0.043

0.129** 0.140**

0.141** 0.175**

-0.019

-0.026 -0.379**
0

0.016
-0.037

-0.326** -0.113**

0.204** 0.147** 0.154**

OTHt-1

0.011

-0.016

0.098*

0.121**

0.035

0.008

-0.019

-0.069

0.012

-0.031

0.005

-0.071

0.01

-0.022

-0.025

0.037

-0.081*

-0.083*

0.018

-0.015

0.204**

OTHt-2

0.024

0.005

0.026

0.132**

0.021

0.02

-0.006

-0.02

-0.016

-0.023

-0.02

0.007

0.029

0.026

-0.027

-0.018

-0.032

-0.046

-0.05

-0.008

0.147** 0.183**

OTHt-3

0.046

0.059

0.015

0.029

-0.007

0.017

0.018

0.002

-0.009

0.003

0.007

-0.027

-0.009

0.021

-0.001

-0.032

-0.05

-0.046

-0.044

-0.047

0.154** 0.118** 0.182**

Source: Summarised from correlation results.

1

0.183** 0.118**
1

0.182**
1

* Correlation is significant at the 0.05 level (2-tailed)
** Correlation is significant at the 0.01 level (2-tailed)

201


4.7 Regression Analysis

This section mainly summarised and analysed the results from conducting the regressions.

Regression models, as proxy for prediction models, were developed to examine the relative ability of predictors in predicting future operating cash flows and test the hypotheses, as described in section 3.5. The dependent variable ($CFO_t$) is the operating cash flows as proxy for future operating cash flows, which was described in section 3.8.2. The predictors are past one, two and three years of earnings, operating cash flows, aggregated accruals, disaggregated accrual components and EBITDA, as described in section 3.8.1.

The statistical tests conducted to evaluate the predictive ability of each models were the F-statistics, t-statistics, Pearson’s correlation coefficient ($r$), Durbin Watson statistics and the level of significance arising from the regressions. The relative contributions and significance of each predictor within the models are evaluated using the t-statistics. When conducting the linear regressions, the cases are excluded listwise to deal with missing data to ensure that all the cases included in the regressions have adequate information for the variables in the regressions. When assessing and testing Pearson’s correlation coefficient between two variables, the cases are excluded pairwise to ensure there is corresponding variable when conducting the correlation tests. The coefficient of determination (adjusted $R^2$) was used to evaluate and compare the predictive strength of each individual regression model, as described in section 3.10.2.

Following Coolican (1990, p.174), the significance test results based on the probability $p$, is reported in three ways: (i) if $0.01 < p < 0.05$, report as significant, (ii), if $0.001 < p < 0.01$, then reported as highly significant and (iii) if $p < 0.001$, reported as very highly significant. The test is reported as insignificant if $p > 0.05$. Two tailed significance tests are used for this study.
Four main regression assumptions, which are linearity, homoscedasticity, residual independence and residuals normality, were checked by analysing the residuals to ensure that these assumptions are not violated as recommended by Field (2009) and Levine et al. (2008) and discussed in section 3.10.1. The Durbin-Watson statistic were computed and used to detect serial correlations between the residuals. A value substantially greater or less 2 indicates the presence of serial correlation (Field 2009). This benchmark value was used to assess the residual independence. Histograms were constructed from the residuals derived from the regression models and visually inspected against the normal distribution curve to check for residual normality. Scatter-plot graphs are developed by plotting standardised residuals against the standardised predicted values and visually examined to ensure homoscedasticity and linearity assumptions are not violated, as recommended by Field (2009) and Levine et al. (2008).

4.7.1 Earnings model: testing hypothesis 1

Hypothesis 1 posits that historical earnings have the significant ability to predict the future operating cash flows of listed Malaysian industrial products manufacturing companies.

Operating cash flows, acting as proxy for future operating cash flows, were regressed systematically on one, two and three years-lag of earnings in three different regression models (Model 1, Model 2 and Model 3). These regression models are illustrated as follows:

One year-lag earnings model:
\[ \text{CFO}_t = b_0 + b_1 \text{EARN}_{t-1} + \rho \]  
(Model 1)

Two years-lag earnings model:
\[ \text{CFO}_t = b_0 + b_1 \text{EARN}_{t-1} + b_2 \text{EARN}_{t-2} + \rho \]  
(Model 2)

Three years-lag earnings model:
\[ \text{CFO}_t = b_0 + b_1 \text{EARN}_{t-1} + b_2 \text{EARN}_{t-2} + b_3 \text{EARN}_{t-3} + \rho \]  
(Model 3)
Table 4.8 summarized the regression statistics from estimating models 1, 2 and 3 to test the ability of past earnings in predicting future operating cash flows. The results revealed that all the three earnings models (Model 1, Model 2 and Model 3) were highly significant in explaining variations in cash flow from operations at year t (CFOₜ) (F statistics, p<0.01). The one year-lag earnings model (Model 1), which has only one predictor (EARNₑ₋₁), was highly significant in explaining 5.7% (adjusted R²=0.057) of CFOₜ (F(1,654)=40.663, p<0.01). When the two years-lag earnings predictor (EARNₑ₋₂) was also included, the two years-lag earnings model (Model 2) was also highly significant in explaining CFOₜ variations (F(2,536)=21.188, p<0.01) and the explanatory powers increased to 7% (adjusted R²=0.07). Although the three years-lag earnings model (Model 3) significantly explained the CFOₜ variations (F(3,433)=9.244, p<0.01), including the three years-lag earnings predictor (EARNₑ₋₃) reduced the explanatory powers of the model to 5.4% (adjusted R²=0.054). Comparing the adjusted R² of all the earnings models, the two years-lag earnings model (Model 2, adjusted R²=0.07) has the strongest explanatory powers while the three years-lag earnings model (Model 3, adjusted R²=0.054) has the weakest explanatory powers.

The Durbin-Watson statistics were close to 2, indicating the residuals of the regression models are uncorrelated and independent. Histograms and scatter-plot graphs were developed from the residuals, which were displayed in Appendix C and D respectively. Visual inspection of these histograms against the normal distribution curve revealed that the residuals displayed normality. The residuals appeared randomly and evenly distributed from the visual inspection of the scatter-plot graphs, indicating that the assumptions of homoscedasticity and linearity are adhered.
Table 4.8  Summary of regressing future operating cash flows on past earnings

<table>
<thead>
<tr>
<th>Model no.</th>
<th>No. of years-lag</th>
<th>N</th>
<th>Adj. R²</th>
<th>F</th>
<th>Sig. p value</th>
<th>Durbin Watson</th>
<th>d.f.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>One</td>
<td>656</td>
<td>0.057</td>
<td>40.663</td>
<td>p&lt;0.01</td>
<td>1.8411</td>
<td>1,654</td>
</tr>
<tr>
<td>2</td>
<td>Two</td>
<td>539</td>
<td>0.07</td>
<td>21.188</td>
<td>p&lt;0.01</td>
<td>1.842</td>
<td>2,536</td>
</tr>
<tr>
<td>3</td>
<td>Three</td>
<td>437</td>
<td>0.054</td>
<td>9.244</td>
<td>p&lt;0.01</td>
<td>2.013</td>
<td>3,433</td>
</tr>
</tbody>
</table>

Source: Developed from regression results.

Table 4.9 summarised the model parameters for the one, two and three years-lag earnings models. These results revealed that the relative contribution of the one year-lag predictor (EARN_{t-1}) within the one year-lag earnings model (Model 1) was positive and highly significant in explaining CFO_{t} variations (t=6.377, p<0.01).

Examining the relative contributions of each predictor within the two years-lag earnings model (Model 2) revealed that only the one year-lag earnings predictor (EARN_{t-1}) was positive and highly significant in explaining CFO_{t} variations (t=4.1, p<0.01). The two years-lag earnings predictor (EARN_{t-2}) was insignificant (t=1.508, p>0.05) in explaining CFO_{t} variations.

The relative contributions of each predictor within the three years-lag earnings model were examined. Only the one year-lag earnings predictor (EARN_{t-1}) was positive and highly significant in explaining CFO_{t} (t=3.329, p<0.01). The other predictors, the two years-lag earnings predictor, EARN_{t-2} (t=0.812 p>0.05) and the three years-lag earnings predictor, EARN_{t-3} (t=0.092, p>0.05) were insignificant in explaining variations in CFO_{t}.

These results revealed that only the past one year-lag predictors (EARN_{t-1}) within all the earnings models (Model 1, Model 2 and Model 3) were positive and significant in explaining CFO_{t} variations for all the models (p<0.05). The other two years-lag and three years-lags predictors (EARN_{t-2}, EARN_{t-3}) were insignificant in explaining CFO_{t} variations (p>0.05).
Table 4.9    Summary of earnings model parameters

| Predictors | One year lag (Model 1) | | | Two years lag (Model 2) | | | Three years lag (Model 3) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Unstd. coefficients | Std. coeff. | t | Sig. p-value | Unstd. coefficients | Std. coeff. | t | Sig. p-value | Unstd. coefficients | Std. coeff. | t | Sig. p-value |
| | B | Std. Error | Beta | | B | Std. Error | Beta | | B | Std. Error | Beta | |
| Constant | 0.038 | 0.003 | - | 11.271 | <0.01 | 0.036 | 0.004 | - | 9.428 | <0.01 | 0.036 | 0.004 | - | 8.319 | <0.01 |
| EARN<sub>t-1</sub> | 0.322 | 0.05 | 0.242 | 6.377 | <0.01 | 0.297 | 0.073 | 0.215 | 4.1 | <0.01 | 0.274 | 0.082 | 0.204 | 3.329 | <0.01 |
| EARN<sub>t-2</sub> | | | | | | 0.109 | 0.072 | 0.079 | 1.508 | >0.05 | 0.076 | 0.093 | 0.055 | 0.812 | >0.05 |
| EARN<sub>t-3</sub> | | | | | | | | | | 0.007 | 0.080 | 0.006 | 0.092 | >0.05 |

Source: Developed from the regression results.
Overall, all three earnings models (Model 1, Model 2 and Model 3) were highly significant in explaining operating cash flows at year t \((CFO_t)\) variations \((p<0.01)\). This is indicative that all the earnings models have highly significant predictive abilities for future operating cash flows prediction. Hypothesis 1 is accepted. Historical earnings have the significant ability to predict the future operating cash flows of listed Malaysian industrial products manufacturing companies. The two years-lag earnings model (Model 2, adjusted \(R^2=0.07\)) has the strongest predictive ability while the three years-lag earnings model (Model 3, adjusted \(R^2=0.054\)) has the weakest predictive ability in predicting future operating cash flows. Within all the earnings models (Model 1, Model 2 and Model 3), only the past one year earnings predictor \((EARN_{t-1})\) was positive and highly significant in predicting future operating cash flows. The other two and three years lags predictors \((EARN_{t-2}, EARN_{t-3})\) were insignificant in predicting future operating cash flows.

### 4.7.2 Operating cash flows model: testing hypothesis 2

Hypothesis 2 posits that historical operating cash flows have the significant ability to predict the future operating cash flows of listed Malaysian industrial products manufacturing companies. Three regression models were developed to test this hypothesis. Operating cash flows were regressed systematically on one, two and three years-lag operating cash flows in three different models (Model 4, Model 5 and Model 6). These regression models were illustrated as follows:

One year-lag operating cash flows model:
\[
CFO_t = c_0 + c_1 CFO_{t-1} + \rho
\]  
(Model 4)

Two years-lag operating cash flows model:
\[
CFO_t = c_0 + c_1 CFO_{t-1} + c_2 CFO_{t-2} + \rho
\]  
(Model 5)

Three years-lag operating cash flows model:
\[
CFO_t = c_0 + c_1 CFO_{t-1} + c_2 CFO_{t-2} + c_3 CFO_{t-3} + \rho
\]  
(Model 6)
Table 4.10 summarized the regression statistics from estimating models 4, 5 and 6 to test the ability of past operating cash flows in predicting future operating cash flows. The results revealed that all the three operating cash flows models (Model 4, Model 5 and Model 6) were highly significant in explaining variations in cash flow from operations (CFO_t) (F statistics, p<0.01). The one year-lag operating cash flows model (Model 4), which has only one predictor (CFO_{t-1}), was highly significant in explaining for 3.2% (adjusted R^2=0.032) of CFO_t variations (F(1,698)=24.246, p<0.01). When the two years-lag operating cash flows predictor (CFO_{t-2}) was included, the two years-lag operating cash flows model (Model 5) was also highly significant in explaining CFO_t variations but the explanatory powers decreased marginally to 3% (adjusted R^2=0.03, F(2,589)=10.251, p<0.01). The three years-lag operating cash flows model (Model 6) was also highly significant in explaining CFO_t variations (F(3, 482)=8.551, p<0.01) and including the three years-lag operating cash flows predictor (CFO_{t-3}) increased the explanatory powers to 4.5% (adjusted R^2=0.045). Comparing the adjusted R^2 of all the models, the three years-lag operating cash flows model (Model 6, adjusted R^2=0.045) has the strongest explanatory powers while the two years-lag operating cash flows model (Model 5, adjusted R^2=0.03) has the least explanatory powers.

The Durbin-Watson statistics were close to 2, indicating the residuals were independent and uncorrelated. Histograms and scatter-plot graphs were developed from the residuals, which were displayed in Appendix C and D respectively. Visual inspection of these histograms against the normal distribution curve revealed that the residuals displayed normality. The residuals appeared randomly and evenly distributed from the visual inspection of the scatter-plot graphs, indicating that the assumptions of homoscedasticity and linearity are adhered.
Table 4.10  Summary results from regressing future operating cash flows on past operating cash flows

<table>
<thead>
<tr>
<th>Model no.</th>
<th>No. of years-lag</th>
<th>N</th>
<th>Adj. R²</th>
<th>F</th>
<th>Sig. p value</th>
<th>Durbin Watson</th>
<th>d.f.</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>One</td>
<td>700</td>
<td>0.032</td>
<td>24.246</td>
<td>p&lt;0.01</td>
<td>2.017</td>
<td>1,698</td>
</tr>
<tr>
<td>5</td>
<td>Two</td>
<td>592</td>
<td>0.03</td>
<td>10.251</td>
<td>p&lt;0.01</td>
<td>2.009</td>
<td>2,589</td>
</tr>
<tr>
<td>6</td>
<td>Three</td>
<td>486</td>
<td>0.045</td>
<td>8.551</td>
<td>p&lt;0.01</td>
<td>1.981</td>
<td>3,482</td>
</tr>
</tbody>
</table>

Source: Developed from the regression results.

Table 4.11 summarised the model parameters for the one, two and three years-lag operating cash flows models. The results revealed that the relative contribution of the past one year operating cash flows predictor (CFO\(_{t-1}\)) within the one year-lag operating cash flows model (Model 4) was positive and highly significant in explaining CFO\(_t\) variations (t=4.924, p<0.01).

When examining the relative contributions of each predictor within the two years-lag operating cash flows model (Model 5), all the predictors were positive and highly significant in explaining CFO\(_t\) variations. These predictors were CFO\(_{t-1}\) (t=2.912, p<0.01) and CFO\(_{t-2}\) (t=2.742, p<0.01).

The relative contributions of each predictor within the three years-lag operating cash flows model (Model 6) were examined. The one year-lag and the three years-lag predictors were positive and significant in explaining CFO\(_t\) variations. These predictors were CFO\(_{t-1}\) (t=2.144, p<0.05) and CFO\(_{t-3}\) (t=3.164, p<0.01). However, the two years-lag predictor (CFO\(_{t-2}\)) was insignificant in explaining CFO\(_t\) variations (t=1.673, p>0.05).

These results revealed that, except for CFO\(_{t-2}\) in the three years-lag operating cash flows model (Model 6), all the other predictors within all the operating cash flows models (Model 4, Model 5 and Model 6) were positive and significant in explaining CFO\(_t\) variations for all the models (p<0.05).
Table 4.11 Summary of operating cash flows model parameters

<table>
<thead>
<tr>
<th>Predictors</th>
<th>One year lag (Model 4)</th>
<th>Two years lag (Model 5)</th>
<th>Three years lag (Model 6)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unstd. coefficients</td>
<td>Std. coeff.</td>
<td>t</td>
</tr>
<tr>
<td>B</td>
<td>0.041</td>
<td>0.003</td>
<td>12.588</td>
</tr>
<tr>
<td>Std. Error</td>
<td>0.181</td>
<td>0.037</td>
<td>0.183</td>
</tr>
<tr>
<td>Beta</td>
<td>0.114</td>
<td>0.042</td>
<td>0.114</td>
</tr>
</tbody>
</table>

Source: Developed from the regression results.
Overall, all the three operating cash flows models (Model 4, Model 5 and Model 6) were highly significant in explaining operating cash flows at year t (CFO<sub>t</sub>) variations (p<0.01). This is indicative that all the operating cash flows models have highly significant predictive abilities for future operating cash flows prediction. Hypothesis 2 is accepted. Historical operating cash flows have the significant ability to predict the future operating cash flows of listed Malaysian industrial products manufacturing companies. The three years-lag operating cash flows model (Model 6, adjusted R<sup>2</sup>=0.045) has the strongest predictive ability while the two years-lag operating cash flows model (Model 5, adjusted R<sup>2</sup>=0.03) has the weakest predictive ability for future operating cash flows. This revealed that the predictive abilities of the operating cash flow models was the highest when all the past three years of operating cash flows (CFO<sub>t-1</sub>, CFO<sub>t-2</sub> and CFO<sub>t-3</sub>) were included in the model. Within all the operating cash flows models (Model 4, Model 5 and Model 6), except for CFO<sub>t-2</sub> in the three years-lag model, most of the past one, two and three years-lag of operating cash flows predictors (CFO<sub>t-1</sub>, CFO<sub>t-2</sub> and CFO<sub>t-3</sub>) were positive and significant in predicting future operating cash flows (p<0.05).

4.7.3 Operating cash flows combined with aggregated accruals model: testing hypothesis 3

Hypothesis 3 posits that historical operating cash flows combined with aggregated accruals have the significant ability to predict the future operating cash flows of listed Malaysian industrial products manufacturing companies. Regression models were developed to test this hypothesis. Operating cash flows, acting as proxy for future operating cash flows, were regressed on one, two and three years-lag operating cash flows and accruals in three different models. These regression models are illustrated as follows:

One year-lag operating cash flows combined with aggregated accruals model:
CFO<sub>t</sub> = d<sub>0</sub> + d<sub>1</sub> CFO<sub>t-1</sub> + d<sub>2</sub> ACR<sub>t-1</sub> + ρ
(Model 7)

Two years-lag operating cash flows combined with aggregated accruals model:
CFO<sub>t</sub> = d<sub>0</sub> + d<sub>1</sub>CFO<sub>t-1</sub> + d<sub>2</sub>CFO<sub>t-2</sub> + d<sub>3</sub>ACR<sub>t-1</sub> + d<sub>4</sub>ACR<sub>t-2</sub> + ρ
(Model 8)
Three years-lag operating cash flows combined with aggregated accruals model:

$$CFO_t = d_0 + d_1CFO_{t-1} + d_2CFO_{t-2} + d_3CFO_{t-3} + d_4ACR_{t-1} + d_5ACR_{t-2} + d_6ACR_{t-3} + \rho$$  \hspace{1cm} (Model 9)

Table 4.12 summarized the regression statistics from estimating models 7, 8 and 9 to test the ability of operating cash flows combined with aggregated accruals in predicting future operating cash flows. The results revealed that all the three operating cash flows combined with aggregated accruals models (Model 7, Model 8 and Model 9) were highly significant in explaining variations in cash flow from operations ($CFO_t$) (F statistics, $p<0.01$). The one year-lag operating cash flows combined with accruals model (Model 7), which has two predictors ($CFO_{t-1}$ and $ACR_{t-1}$), was highly significant in explaining 8.3% (adjusted $R^2=0.083$) of $CFO_t$ variations ($F=31.488$, $p<0.01$). When the two-years lag cash flows and accruals variables ($CFO_{t-2}$ and $ACR_{t-2}$) were included, the two years-lag model (Model 8) was also highly significant ($F(4,554) = 13.665$, $p<0.01$) in explaining the $CFO_t$ variations and the predictive abilities remained the same as the Model 7 at 8.3% (adjusted $R^2=0.083$). Although the three years-lag model (Model 9) was highly significant ($F(6,447)=7.334$, $p<0.01$) in explaining $CFO_t$ variations, including the three years-lag operating cash flows and accruals predictors ($CFO_{t-3}$ and $ACR_{t-3}$) caused the explanatory powers of the model to decline to 7.7% (adjusted $R^2=0.077$). This implied that the additional three years-lag predictors reduced the explanatory powers of the model.

Comparing the adjusted $R^2$, the one year-lag model (Model 7, adjusted $R^2=0.083$) has the same explanatory powers as the two years-lag model (Model 8, adjusted $R^2=0.083$) while the three years-lag model (Model 9, adjusted $R^2=0.077$) has the least explanatory powers.

The Durbin-Watson statistics were close to 2, indicating the residuals were independent and uncorrelated. Histograms and scatter-plot graphs were developed from the residuals, which were displayed in Appendix C and D respectively. Visual inspection of these histograms against the normal distribution curve revealed that the residuals displayed normality. The residuals appeared randomly and evenly distributed from visually
inspecting the scatter-plot graphs, indicating that the assumptions of homoscedasticity and linearity are adhered.

Table 4.12 Summary results from regressing future operating cash flows on past operating cash flows combined with aggregated accruals

<table>
<thead>
<tr>
<th>Model no.</th>
<th>No. of years-lag</th>
<th>N</th>
<th>Adj. R²</th>
<th>F</th>
<th>Sig. p value</th>
<th>Durbin Watson</th>
<th>d.f.</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>One</td>
<td>677</td>
<td>0.083</td>
<td>31.488</td>
<td>p&lt;0.01</td>
<td>2.059</td>
<td>2,674</td>
</tr>
<tr>
<td>8</td>
<td>Two</td>
<td>559</td>
<td>0.083</td>
<td>13.665</td>
<td>p&lt;0.01</td>
<td>1.922</td>
<td>4,554</td>
</tr>
<tr>
<td>9</td>
<td>Three</td>
<td>454</td>
<td>0.077</td>
<td>7.334</td>
<td>P&lt;0.01</td>
<td>1.928</td>
<td>6,447</td>
</tr>
</tbody>
</table>

Source: Developed from the regression results.

Table 4.13 summarized the model parameters for the one, two and three years-lag operating cash flows combined with aggregated accruals regression models. The results revealed that the relative contributions of all the predictors within the one year-lag model (Model 7) were positive and highly significant in explaining CFOₜ variations. These positive and highly significant one year-lag predictors were CFOₜ₋₁ (ₜ=07.713, p<0.01) and ACRₜ₋₁ (ₜ=5.827, p<0.01).

Examining the relative contributions of each predictor within the two years-lag model (Model 8) revealed that only the one year-lag operating cash flows and aggregated accruals predictors were positive and highly significant in explaining CFOₜ variations, (p<0.01). These predictors were CFOₜ₋₁ (ₜ=4.707, p<0.01) and ACRₜ₋₁ (ₜ=4.563, p<0.01). The other two years-lag operating cash flows and accruals predictors were insignificant in explaining CFOₜ variations and the two years-lag accruals have negative signs. These predictors were CFOₜ₋₂ (ₜ= 1.396, p>0.05) and ACRₜ₋₂ (ₜ= - 0.061, p>0.05).

Examining the relative contributions of each predictor within the three years-lag model (Model 9) revealed that only the one year-lag predictors were positive and highly significant in explaining CFOₜ variations,. These predictors were CFOₜ₋₁ (ₜ=3.45, p<0.01) and ACRₜ₋₁ (ₜ=3.488, p<0.01). The two and three years-lag operating cash flows and
accruals predictors were insignificant in explaining CFO_t variations, and the three years-lag accruals (ACR_{t-3}) has negative signs. These insignificant predictors were CFO_{t-2} (t=1.325, p>0.05), CFO_{t-3} (t=0.727, p>0.05), ACR_{t-2} (t=0.593, p>0.05) and ACR_{t-3} (t=-0.693, p>0.05).

These results revealed that only the past one year-lag predictors (CFO_{t-1} and ACR_{t-1}) within all the models (Model 7, Model 8 and Model 9) were positive and significant in explaining CFO_t variations for all the models (p<0.05). The other two years-lag and three years-lags predictors (CFO_{t-2}, CFO_{t-3}, ACR_{t-2}, ACR_{t-3}) were insignificant and some of the insignificant accruals predictors (ACR_{t-2}, ACR_{t-3}) have negative coefficients (p>0.05).
Table 4.13  Summary of operating cash flows combined with aggregated accruals model parameters

<table>
<thead>
<tr>
<th>Predictors</th>
<th>One year lag (Model 7)</th>
<th>Two years lag (Model 8)</th>
<th>Three years lag (Model 9)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unstd. coefficients</td>
<td>Std. coeff.</td>
<td>Beta</td>
</tr>
<tr>
<td>Constant</td>
<td>0.038</td>
<td>0.003</td>
<td>11.512</td>
</tr>
<tr>
<td>CFO_{t-1}</td>
<td>0.347</td>
<td>0.045</td>
<td>0.341</td>
</tr>
<tr>
<td>CFO_{t-2}</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CFO_{t-3}</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACR_{t-1}</td>
<td>0.241</td>
<td>0.041</td>
<td>0.258</td>
</tr>
<tr>
<td>ACR_{t-2}</td>
<td></td>
<td></td>
<td>-0.003</td>
</tr>
<tr>
<td>ACR_{t-3}</td>
<td></td>
<td></td>
<td>-0.043</td>
</tr>
</tbody>
</table>

Source: Developed from the regression results.
Overall, all the three past operating cash flows combined with aggregated accruals models (Model 7, Model 8 and Model 9) were highly significant in explaining operating cash flows at year $t$ ($CFO_t$) variations ($p<0.01$). This is indicative that all these models have highly significant predictive abilities for future operating cash flows prediction. Hypothesis 3 is accepted. Historical operating cash flows combined with aggregated accruals have the significant ability to predict the future operating cash flows of listed Malaysian industrial products manufacturing companies. The three years-lag model (Model 9, adjusted $R^2=0.077$) has the weakest predictive ability for future operating cash flows. However, the findings were inconclusive on the model with the strongest predictive ability since the one year-lag model (Model 7, adjusted $R^2=0.083$) and the two years-lag model (Model 8, adjusted $R^2=0.083$) has the same predictive ability for future operating cash flows. Within all the prediction models (Model 7, Model 8 and Model 9), only the one year-lag operating cash flows and accruals predictors ($CFO_{t-1}$ and $ACR_{t-1}$) were positive and highly significant in predicting future operating cash flows ($p<0.01$). The other predictors within all the models, which are two and three years-lag operating cash flows and aggregated accruals predictors ($CFO_{t-2}$, $CFO_{t-3}$, $ACR_{t-2}$, $ACR_{t-3}$), were insignificant in predicting future operating cash flows and some of these insignificant (aggregated accruals) predictors ($ACR_{t-2}$, $ACR_{t-3}$) have negative coefficients ($p>0.05$).

4.7.4 Operating cash flows combined with disaggregated accrual components model: testing hypothesis 4

Hypothesis 4 posits that historical operating cash flows information combined with disaggregated accrual components have the significant ability to predict the future operating cash flows of listed Malaysian industrial products manufacturing companies. Regression models were developed to test this hypothesis. Operating cash flows ($CFO_t$), acting as proxy for future operating cash flows, were regressed on one, two and three years-lag operating cash flows and disaggregated accrual components in three different models. These disaggregated accrual components were $DEPRM_{t-i}$, $INV_{t-i}$, $AR_{t-i}$, $AP_{t-i}$ and $OTH_{t-i}$ and the regression models were illustrated as follows:
One year-lag operating cash flows combined with disaggregated accrual components model:
\[ \text{CFO}_t = e_0 + e_1\text{CFO}_{t-1} + e_2\Delta\text{AR}_{t-1} + e_3\Delta\text{AP}_{t-1} + e_4\Delta\text{INV}_{t-1} + e_5\Delta\text{OTH}_{t-1} + e_6\text{DEPRM}_{t-1} + \rho \] (Model 10)

Two years-lag operating cash flows combined with disaggregated accrual components model:
\[ \text{CFO}_t = e_0 + e_1\text{CFO}_{t-1} + e_2\text{CFO}_{t-2} + e_3\Delta\text{AR}_{t-1} + e_4\Delta\text{AR}_{t-2} + e_5\Delta\text{AP}_{t-1} + e_6\Delta\text{AP}_{t-2} + e_7\Delta\text{INV}_{t-1} + e_8\Delta\text{INV}_{t-2} + e_9\Delta\text{OTH}_{t-1} + e_{10}\Delta\text{OTH}_{t-2} + e_{11}\text{DEPRM}_{t-1} + e_{12}\text{DEPRM}_{t-2} + \rho \] (Model 11)

Three years-lag operating cash flows combined with disaggregated accrual components model:
\[ \text{CFO}_t = e_0 + e_1\text{CFO}_{t-1} + e_2\text{CFO}_{t-2} + e_3\text{CFO}_{t-3} + e_4\Delta\text{AR}_{t-1} + e_5\Delta\text{AR}_{t-2} + e_6\Delta\text{AR}_{t-3} + e_7\Delta\text{AP}_{t-1} + e_8\Delta\text{AP}_{t-2} + e_9\Delta\text{AP}_{t-3} + e_{10}\Delta\text{INV}_{t-1} + e_{11}\Delta\text{INV}_{t-2} + e_{12}\Delta\text{INV}_{t-3} + e_{13}\text{DEPRM}_{t-1} + e_{14}\text{DEPRM}_{t-2} + e_{15}\text{DEPRM}_{t-3} + e_{16}\Delta\text{OTH}_{t-1} + e_{17}\Delta\text{OTH}_{t-2} + e_{18}\Delta\text{OTH}_{t-3} + \rho \] (Model 12)

Table 4.14 summarized the regression statistics from estimating models 10, 11 and 12 to test the ability of cash flows combined with disaggregated accrual components models in predicting future operating cash flows. The results revealed that all the three operating cash flows combined with disaggregated accrual components models (Model 10, Model 11 and Model 12) were highly significant in explaining variations in cash flow from operations (CFO_t) (F statistics, p<0.01). The one year-lag operating cash flows and disaggregated accrual model (Model 10) was highly significant in explaining 12.2% (adjusted R^2=0.122) of CFO_t variations (F(6,512)=12.953, p<0.01). When the two years-lag operating cash flows and disaggregated accrual components predictors were included, the two years-lag model (Model 11) was also highly significant (F(12,335)=6.478, p<0.01) and the explanatory powers improved to 15.9% (adjusted R^2=0.159). Although the three years-lag model (Model 12) was also highly significant (F(18,216)=3.269, p<0.01), the additional three years-lag cash flows and accrual components predictors...
reduced the explanatory powers of the model to 14.9% (adjusted $R^2=0.149$). This implied that the additional three years-lag predictors reduced the predictive abilities of the models. Comparing the adjusted $R^2$, the two years-lag model (Model 11, adjusted $R^2=0.159$) has the strongest explanatory powers while the weakest was the one year-lag model (Model 10, adjusted $R^2=0.122$).

The Durbin-Watson statistics were close to 2, indicating the residuals were independent and uncorrelated. Histograms and scatter-plot graphs were developed from the residuals, which were displayed in Appendix C and D respectively. Visual inspection of these histograms against the normal distribution curve revealed that the residuals displayed normality. The residuals appeared randomly and evenly distributed from the visual inspection of the scatter-plot graphs, indicating that the assumptions of homoscedasticity and linearity are adhered.

Table 4.14 Summary results from regressing future operating cash flows on past operating cash flows combined with disaggregated accrual components

<table>
<thead>
<tr>
<th>Model no.</th>
<th>No. of years-lag</th>
<th>N</th>
<th>Adj. $R^2$</th>
<th>$F$</th>
<th>Sig. p value</th>
<th>Durbin Watson</th>
<th>d.f.</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>One</td>
<td>519</td>
<td>0.122</td>
<td>12.953</td>
<td>p&lt;0.01</td>
<td>1.917</td>
<td>6,512</td>
</tr>
<tr>
<td>11</td>
<td>Two</td>
<td>348</td>
<td>0.159</td>
<td>6.478</td>
<td>p&lt;0.01</td>
<td>1.907</td>
<td>12,335</td>
</tr>
<tr>
<td>12</td>
<td>Three</td>
<td>235</td>
<td>0.149</td>
<td>3.269</td>
<td>p&lt;0.01</td>
<td>1.975</td>
<td>18,216</td>
</tr>
</tbody>
</table>

Source: Developed from the regression results.

Table 4.15 summarized the model parameters for the one, two and three years-lag operating cash flows combined with disaggregated accrual components models. The results revealed that except for the one year-lag other accruals predictor ($OH_{t-1}$, $t=1.152$, $p>0.1$), the relative contributions of all the other predictors within the one year-lag model (Model 10) were significant in explaining CFO$_t$ variations ($p<0.05$). The one year-lag predictors that were significant were CFO$_{t-1}$ ($t=7.941$, $p<0.01$), INV$_{t-1}$ ($t=3.405$, $p<0.01$), AR$_{t-1}$ ($t=3.762$, $p<0.05$), AP$_{t-1}$ ($t=2.037$, $p<0.01$) and DEPRM$_{t-1}$ ($t=-1.703$, $p<0.01$). Only one predictor, which was the one year-lag depreciation and amortization variable.
(DEPRMt-1), was significantly negative while the other one year-lag predictors were significantly positive (p<0.01) in explaining CFOt variations.

Examining the relative contributions of each predictor within the two years-lag model (Model 11) revealed that most of the one year-lag predictors were positive and highly significant in explaining CFOt variations. These positive and highly significant predictors were CFOt-1 (t=6.088, p<0.01), INVt-1 (t=4.419, p<0.01), ARt-1 (t=4.403, p<0.01) and APt-1 (t=2.888, p<0.01). The one year-lag predictors that were insignificant in explaining CFOt variations were DEPRMt-1 (t=0.187, p>0.05) and OTHt-1 predictors (t=0.688, p>0.1). All the two years-lag predictors were also insignificant in contributing towards explaining CFOt variations (p>0.05).

The results from evaluating the relative contributions of each predictor within the three years-lag model (Model 12) were similar to the two years-lag model (Model 11). For the three years-lag model (Model 12), the highly significant predictors in explaining CFOt-1 variations were mainly the one year-lag predictors, which were CFOt-1 (t=4.473, p<0.01), INVt-1 (t=3.512, p<0.01), and ARt-1 (t=3.079, p<0.01) and one of the two-years lag predictor, which was INVt-2 (t= -2.747, p<0.01). All the one year-lag predictors were positive and highly significant in explaining CFOt-1 variations while the two years-lag predictor, INVt-2, was highly significantly negative in explaining CFOt-1 variations. The other predictors in this model, which were the two years-lag predictors and all the three years-lag predictors, were insignificant in explaining CFOt-1 variations (p>0.05) for Model 11.

These results revealed that most of the one year-lag predictors within all the models (Model 10, Model 11 and Model 12) were highly significant in explaining CFOt-1 variations for all the models. CFOt-1, INVt-1, ARt-1 were positive and highly significant in explaining CFOt-1 variations (p<0.01) for all the three models. However, DEPRMt-1 was negative and highly significantly (p<0.01) contributed towards explaining CFOt-1 variations only for the one year-lag model (Model 10). This variable was insignificant in the two and three years-lag models (Model 11 and Model 12). The APt-1 was positive.
and significant (p<0.05) in explaining CFO_{t-1} variations for the one year-lag (Model 11) and two years-lag models (Model 12). Except for INV_{t-2} (t=-0.511, p<0.01) in the three years-lag model (Model 12), all the other individual two years-lag and three years-lag predictors were insignificant (p>0.05) in explaining CFO_{t-1} variations for all the models.
Table 4.15 Summary of operating cash flows combined with disaggregated accrual components model parameters

<table>
<thead>
<tr>
<th>Predictors</th>
<th>One year lag (Model 10)</th>
<th></th>
<th></th>
<th></th>
<th>Two years lag (Model 11)</th>
<th></th>
<th></th>
<th></th>
<th>Three years lag (Model 12)</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unstd. coefficients</td>
<td>Std. coeff.</td>
<td>t</td>
<td>Sig. p-value</td>
<td>Unstd. coefficients</td>
<td>Std. coeff.</td>
<td>t</td>
<td>Sig. p-value</td>
<td>Unstd. coefficients</td>
<td>Std. coeff.</td>
<td>t</td>
<td>Sig. p-value</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>0.009</td>
<td>0.008</td>
<td>1.176</td>
<td>&gt;0.05</td>
<td>0.006</td>
<td>0.009</td>
<td>0.645</td>
<td>&gt;0.05</td>
<td>-0.007</td>
<td>0.012</td>
<td>0.565</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>CFO_t-1</td>
<td>0.450</td>
<td>0.057</td>
<td>0.382</td>
<td>7.941</td>
<td>&lt;0.01</td>
<td>0.562</td>
<td>0.092</td>
<td>0.502</td>
<td>6.088</td>
<td>&lt;0.01</td>
<td>0.501</td>
<td>0.112</td>
</tr>
<tr>
<td>CFO_t-2</td>
<td>-0.115</td>
<td>0.099</td>
<td>0.098</td>
<td>-1.161</td>
<td>&gt;0.05</td>
<td>-0.205</td>
<td>0.141</td>
<td>-0.187</td>
<td>-1.456</td>
<td>&gt;0.05</td>
<td>-0.205</td>
<td>0.141</td>
</tr>
<tr>
<td>CFO_t-3</td>
<td>0.170</td>
<td>0.125</td>
<td>0.147</td>
<td>1.357</td>
<td>&gt;0.05</td>
<td>0.753</td>
<td>0.497</td>
<td>0.183</td>
<td>1.516</td>
<td>&gt;0.05</td>
<td>0.753</td>
<td>0.497</td>
</tr>
<tr>
<td>DEPRM_t-1</td>
<td>-0.309</td>
<td>0.181</td>
<td>-0.072</td>
<td>-1.703</td>
<td>&lt;0.01</td>
<td>0.077</td>
<td>0.414</td>
<td>0.180</td>
<td>0.187</td>
<td>&gt;0.05</td>
<td>0.077</td>
<td>0.414</td>
</tr>
<tr>
<td>DEPRM_t-2</td>
<td>-0.470</td>
<td>0.423</td>
<td>-0.110</td>
<td>-1.111</td>
<td>&gt;0.05</td>
<td>-0.715</td>
<td>0.539</td>
<td>-0.171</td>
<td>-1.327</td>
<td>&gt;0.05</td>
<td>-0.715</td>
<td>0.539</td>
</tr>
<tr>
<td>DEPRM_t-3</td>
<td>-0.233</td>
<td>0.503</td>
<td>-0.055</td>
<td>-0.462</td>
<td>&gt;0.05</td>
<td>0.623</td>
<td>0.177</td>
<td>0.272</td>
<td>3.512</td>
<td>&lt;0.01</td>
<td>0.623</td>
<td>0.177</td>
</tr>
<tr>
<td>INV_t-1</td>
<td>0.344</td>
<td>0.101</td>
<td>0.147</td>
<td>3.405</td>
<td>&lt;0.01</td>
<td>0.631</td>
<td>0.143</td>
<td>0.268</td>
<td>4.419</td>
<td>&lt;0.01</td>
<td>0.631</td>
<td>0.143</td>
</tr>
<tr>
<td>INV_t-2</td>
<td>-0.122</td>
<td>0.137</td>
<td>-0.051</td>
<td>-0.889</td>
<td>&gt;0.05</td>
<td>-0.511</td>
<td>0.186</td>
<td>-0.217</td>
<td>-2.747</td>
<td>&lt;0.01</td>
<td>-0.511</td>
<td>0.186</td>
</tr>
<tr>
<td>INV_t-3</td>
<td>0.005</td>
<td>0.171</td>
<td>0.002</td>
<td>0.030</td>
<td>&gt;0.05</td>
<td>0.403</td>
<td>0.131</td>
<td>0.265</td>
<td>3.079</td>
<td>&lt;0.01</td>
<td>0.403</td>
<td>0.131</td>
</tr>
<tr>
<td>AR_t-1</td>
<td>0.277</td>
<td>0.074</td>
<td>0.184</td>
<td>3.762</td>
<td>&lt;0.01</td>
<td>0.437</td>
<td>0.099</td>
<td>0.288</td>
<td>4.403</td>
<td>&lt;0.01</td>
<td>0.437</td>
<td>0.099</td>
</tr>
<tr>
<td>AR_t-2</td>
<td>-0.070</td>
<td>0.116</td>
<td>-0.430</td>
<td>-0.605</td>
<td>&gt;0.05</td>
<td>-0.084</td>
<td>0.158</td>
<td>-0.050</td>
<td>-0.529</td>
<td>&gt;0.05</td>
<td>-0.084</td>
<td>0.158</td>
</tr>
<tr>
<td>AR_t-3</td>
<td>0.102</td>
<td>0.146</td>
<td>0.063</td>
<td>0.701</td>
<td>&gt;0.05</td>
<td>0.210</td>
<td>0.198</td>
<td>0.085</td>
<td>1.059</td>
<td>&gt;0.05</td>
<td>0.210</td>
<td>0.198</td>
</tr>
<tr>
<td>AP_t-1</td>
<td>0.216</td>
<td>0.106</td>
<td>0.094</td>
<td>2.037</td>
<td>&lt;0.05</td>
<td>0.418</td>
<td>0.145</td>
<td>0.180</td>
<td>2.888</td>
<td>&lt;0.01</td>
<td>0.418</td>
<td>0.145</td>
</tr>
<tr>
<td>AP_t-2</td>
<td>-0.074</td>
<td>0.134</td>
<td>-0.033</td>
<td>-0.549</td>
<td>&gt;0.05</td>
<td>-0.219</td>
<td>0.181</td>
<td>-0.098</td>
<td>-1.215</td>
<td>&gt;0.05</td>
<td>-0.219</td>
<td>0.181</td>
</tr>
<tr>
<td>AP_t-3</td>
<td>-0.051</td>
<td>0.179</td>
<td>0.023</td>
<td>-0.285</td>
<td>&gt;0.05</td>
<td>-0.280</td>
<td>0.221</td>
<td>-0.009</td>
<td>-1.126</td>
<td>&gt;0.05</td>
<td>-0.280</td>
<td>0.221</td>
</tr>
<tr>
<td>OTH_t-1</td>
<td>0.154</td>
<td>0.133</td>
<td>0.048</td>
<td>1.152</td>
<td>&gt;0.05</td>
<td>0.123</td>
<td>0.179</td>
<td>0.390</td>
<td>0.688</td>
<td>&gt;0.05</td>
<td>0.123</td>
<td>0.179</td>
</tr>
<tr>
<td>OTH_t-2</td>
<td>0.087</td>
<td>0.179</td>
<td>0.026</td>
<td>0.486</td>
<td>&gt;0.05</td>
<td>-0.093</td>
<td>0.262</td>
<td>-0.027</td>
<td>-0.356</td>
<td>&gt;0.05</td>
<td>-0.093</td>
<td>0.262</td>
</tr>
<tr>
<td>OTH_t-3</td>
<td>0.392</td>
<td>0.225</td>
<td>0.117</td>
<td>1.746</td>
<td>&gt;0.05</td>
<td>0.154</td>
<td>0.133</td>
<td>0.048</td>
<td>1.152</td>
<td>&gt;0.05</td>
<td>0.154</td>
<td>0.133</td>
</tr>
</tbody>
</table>

Source: Developed from regression results
Overall, all the three past operating cash flows combined with disaggregated accrual components models (Model 10, Model 11 and Model 12) were highly significant in explaining operating cash flows at year \( t \) \((\text{CFO}_t)\) variations \((p<0.01)\). This is indicative that all these models have highly significant predictive abilities for future operating cash flows prediction. Hypothesis 4 is accepted. Historical operating cash flows information combined with disaggregated accrual components have the significant ability to predict the future operating cash flows of listed Malaysian industrial products manufacturing companies. The two-years lag model (Model 11, adjusted \( R^2=0.159 \)) has the highest predictive ability while the one year-lag model (Model 10, adjusted \( R^2=0.122 \)) has the lowest predictive ability for future operating cash flows. Within all the models (Model 10, Model 11 and Model 12), most of the one year-lag predictors (\( \text{CFO}_{t-1}, \text{INV}_{t-1}, \text{AR}_{t-1}, \text{DEPRM}_{t-1} \)) were highly significant in predicting future operating cash flows. Except for the two years-lag \( \text{INV}_{t-2} \) predictor \((t=-0.511, p<0.01)\) in the three years-lag model (Model 12), all the other two and three years-lag predictors within all the models (Model 10, Model 11 and Model 12) were insignificant in predicting future operating cash flows \((p>0.05)\).

### 4.7.5 EBITDA model: testing hypothesis 5

Hypothesis 5 posits that EBITDA have the significant ability to predict the future operating cash flows of listed Malaysian industrial products manufacturing companies. Operating cash flows \((\text{CFO}_t)\) were regressed on one, two and three years-lag EBITDA in three different models. These regression models were illustrated as follows:

One year-lag EBITDA model:

\[
\text{CFO}_t = f_0 + f_1 \text{EBITDA}_{t-1} + \rho
\]

(Model 13)

Two years-lag EBITDA model:

\[
\text{CFO}_t = f_0 + f_1 \text{EBITDA}_{t-1} + f_2 \text{EBITDA}_{t-2} + \rho
\]

(Model 14)

Three years-lag EBITDA model:

\[
\text{CFO}_t = f_0 + f_1 \text{EBITDA}_{t-1} + f_2 \text{EBITDA}_{t-2} + f_3 \text{EBITDA}_{t-3} + \rho
\]

(Model 15)
Table 4.16 summarized the regression statistics from estimating models 13, 14 and 15 to test the ability of EBITDA in predicting future operating cash flows. The results revealed that all the three EBITDA models (Model 13, Model 14 and Model 15) were highly significant in explaining variations in cash flow from operations at year t (CFOₜ) (F statistics, p<0.01). The one year-lag EBITDA model (Model 13) significantly accounts for 8% (adjusted R²=0.08) of CFOₜ variations (F(1,702)=62.423, p<0.01). When the two years-lag EBITDA predictor was included, the two years-lag EBITDA model (Model 14) was also significant (F(2,592)=30.988, p<0.01) and the explanatory powers of the model increased to 9.2% (adjusted R²=0.092). Although the three years-lag EBITDA model (Model 15) was significant (F(3,489)=16.147, p<0.01), the additional three years-lag EBITDA predictor caused the explanatory powers of the overall model to decline to 8.5% (adjusted R²=0.085). Comparing the adjusted R², the two years-lag EBITDA model (Model 14, adjusted R²=0.092) has the highest explanatory powers while the one year-lag EBITDA model (Model 15, adjusted R²=0.08) has the weakest.

The Durbin-Watson statistics were close to 2, indicating that the residuals were independent and uncorrelated. Histograms and scatter-plot graphs were developed from the residuals, which were displayed in Appendix C and D respectively. Visual inspection of the histograms against the normal distribution curve revealed that the residuals displayed normality. The residuals appeared randomly and evenly distributed from the visual inspection of the scatter-plot graphs, indicating that the assumptions of homoscedasticity and linearity are adhered.

### Table 4.16  Summary results from regressing future operating cash flows on past EBITDA

<table>
<thead>
<tr>
<th>Model no.</th>
<th>No. of years-lag</th>
<th>N</th>
<th>Adj. R²</th>
<th>F</th>
<th>Sig. p value</th>
<th>Durbin Watson</th>
<th>d.f.</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>One</td>
<td>704</td>
<td>0.08</td>
<td>62.423</td>
<td>p&lt;0.01</td>
<td>1.912</td>
<td>1,702</td>
</tr>
<tr>
<td>14</td>
<td>Two</td>
<td>595</td>
<td>0.092</td>
<td>30.988</td>
<td>p&lt;0.01</td>
<td>1.809</td>
<td>2,592</td>
</tr>
<tr>
<td>15</td>
<td>Three</td>
<td>493</td>
<td>0.085</td>
<td>16.147</td>
<td>p&lt;0.01</td>
<td>1.877</td>
<td>3,489</td>
</tr>
</tbody>
</table>

Source: Developed from the regression results.
Table 4.17 summarized the model parameters for the one, two and three years-lag EBITDA models. The results revealed that the relative contribution of the one year-lag predictor (EBITDA_{t-1}) within the one year-lag EBITDA model (Model 13) was positive and highly significant in explaining CFO_t variations (t=7.901, p<0.01).

Evaluating the relative contributions of each predictor within the two years-lag EBITDA model (Model 14), all the predictors were positive and highly significant in explaining CFO_t variations. These predictors were EBITDA_{t-1} (t=4.672, p<0.01) and EBITDA_{t-2} (t=2.092, p<0.05).

The relative contributions of each predictor within the three years-lag EBITDA model (Model 15) were examined. The one year-lag and the two years-lag predictors in this model (Model 15) were positive and significant in explaining CFO_t variations. These significant predictors were EBITDA_{t-1} (t=4.039, p<0.01) and EBITDA_{t-2} (t=2.003, p<0.05). However, the three years-lag predictor (EBITDA_{t-3}) was insignificant (t=-0.537, p>0.05) in explaining CFO_t variations.

These results revealed that the past one and two years-lag predictors (EBITDA_{t-1}; EBITDA_{t-2}) within all the EBITDA models (Model 13, Model 14 and Model 15) were positive and significant in explaining CFO_t variations for all the EBITDA models (p<0.05). The three years-lag predictor (EBITDA_{t-3}) were insignificant in explaining CFO_t variations (p>0.05).
Table 4.17  Summary of EBITDA model parameters

<table>
<thead>
<tr>
<th>Predictors</th>
<th>One year lag (Model 13)</th>
<th>Two years lag (Model 14)</th>
<th>Three years lag (Model 15)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unstd. coefficients</td>
<td>Std. coeff.</td>
<td>t</td>
</tr>
<tr>
<td>B</td>
<td>0.024</td>
<td>0.004</td>
<td>5.669</td>
</tr>
<tr>
<td>Std. Error</td>
<td>0.28</td>
<td>0.035</td>
<td>0.286</td>
</tr>
<tr>
<td>Beta</td>
<td>0.86</td>
<td>0.07</td>
<td>0.866</td>
</tr>
<tr>
<td>EBITDA t-1</td>
<td>-0.027</td>
<td>0.055</td>
<td>-0.028</td>
</tr>
</tbody>
</table>

Source: Developed from the regression results.
Overall, all three EBITDA models (Model 13, Model 14 and Model 15) were highly significant in explaining operating cash flows at year t (CFO_t) variations (p<0.01). This is indicative that all the EBITDA models have highly significant predictive abilities for future operating cash flows prediction. Hypothesis 5 is accepted. Historical EBITDA has the significant ability to predict the future operating cash flows of listed Malaysian industrial products manufacturing companies. The two years-lag EBITDA model (Model 14, adjusted R²=0.092) has the strongest predictive ability while the one year-lag EBITDA model (Model 15, adjusted R²=0.08) has the least predictive ability for future operating cash flows. Within all the EBITDA models (Model 13, Model 14 and Model 15), only the one year-lag and two years-lag predictors (EBITDA_t-1; EBITDA_t-2) were positive and significant in predicting future operating cash flows (p<0.05). The three years-lag EBITDA predictor (EBITDA_t-3) was insignificant in predicting future operating cash flows (p>0.05).

4.7.6 Comparing the predictive abilities for all the models: testing hypothesis 6
Hypotheses 6 posits that the ability of operating cash flows combined with disaggregated accrual components model is the most superior compared to earnings, operating cash flows, operating cash flow combined with aggregated accruals and EBITDA models in predicting the future operating cash flows of listed Malaysian industrial products manufacturing companies.

The relative predictive abilities of each model were examined by comparing the adjusted R² values derived from the regression models developed from the within sample. The higher the adjusted R², the stronger is the predictive abilities for future operating cash flows. This approach is consistent with prior studies, such as Al-Attar and Hussain (2004), Barth et al. (2001), Chotkunakitti (2005), Dechow et al. (1998), Ebaid (2011), Farshadfar et al. (2008) and Stammerjohan and Nassiripour (2001).

Table 4.18 summarized the adjusted R² and the significance results for each regression model. Analysis of table 4.18 revealed that all the prediction models were highly significant in predicting future operating cash flows (p<0.01). Comparing the adjusted R²
for all the one year-lag models, the operating cash flows combined with disaggregated accrual components model (adjusted $R^2=0.122$) has the strongest predictive ability for future operating cash flows. This was followed by the operating cash flows combined with aggregated accruals model (adjusted $R^2=0.083$). The one year-lag EBITDA model has higher predictive ability (adjusted $R^2=0.08$) than both the one year-lag earnings model (adjusted $R^2=0.057$) and the one year-lag operating cash flows model (adjusted $R^2=0.032$). The operating cash flows model has the weakest ability for future operating cash flows prediction.

Examining the two years-lag models revealed similar results as the one year-lag models comparison. The two years-lag operating cash flows combined with disaggregated accrual components model (adjusted $R^2=0.159$) has the strongest ability in predicting future operating cash flows. The two years-lag EBITDA model (adjusted $R^2=0.092$) has the second highest predictive ability and is stronger than the operating cash flows combined with the aggregated accruals model (adjusted $R^2=0.083$), the earnings model (adjusted $R^2=0.07$) and the operating cash flows model (adjusted $R^2=0.03$). The operating cash flows model has the weakest ability for future operating cash flows prediction.

Comparing the three years-lag models, the highest explanatory powers in explaining the variation in future operating cash flows is the operating cash flows combined with disaggregated accrual components model (adjusted $R^2=0.149$). Similar to the two years-lag models comparison, the three years-lag EBITDA model (adjusted $R^2=0.085$) has the second strongest predictive ability. This is followed by the operating cash flows combined with aggregated accruals model (adjusted $R^2=0.077$), which has stronger predictive ability than the three years-lag earnings model (adjusted $R^2=0.054$) and the three years-lag operating cash flows model (adjusted $R^2=0.045$). The operating cash flows model has also the weakest ability in predicting future operating cash flows.
Table 4.18 Adjusted R² summary for all the regression models

<table>
<thead>
<tr>
<th>No. of lagged years</th>
<th>Earnings model</th>
<th>Operating cash flows model</th>
<th>Operating cash flows combined with aggregated accruals model</th>
<th>Operating cash flows combined with disaggregated accrual components model</th>
<th>EBITDA model</th>
</tr>
</thead>
<tbody>
<tr>
<td>One</td>
<td>0.057*</td>
<td>0.032*</td>
<td>0.083*</td>
<td>0.122*</td>
<td>0.08*</td>
</tr>
<tr>
<td>Two</td>
<td>0.07*</td>
<td>0.03*</td>
<td>0.083*</td>
<td>0.159*</td>
<td>0.092*</td>
</tr>
<tr>
<td>Three</td>
<td>0.054*</td>
<td>0.045*</td>
<td>0.077*</td>
<td>0.149*</td>
<td>0.085*</td>
</tr>
</tbody>
</table>

* Highly significant at 0.01 level (2 tailed).
Source: Developed from the regression results.

Table 4.19 ranked the strength of the models in predicting future operating cash flows based on the adjusted R² values. Analysing table 4.19 revealed that the three operating cash flows combined with disaggregated accrual components models have the strongest predictive abilities for future operating cash flows compared to the other models for all the one, two and three years-lag models examined. The predictive abilities of all the three operating cash flows combined with aggregated accruals models are superior to both the earnings and operating cash flows models.

All the three EBITDA models have superior predictive abilities compared to both the earnings model and the operating cash flows model in predicting future operating cash flows. As the prediction horizon increases and additional past EBITDA are included in the model, the predictive abilities of the EBITDA models strengthen such that it even exceeds the predictive strength of the operating cash flows combined with aggregated accruals model in the two and three years-lag models.

All the three earnings models have superior abilities compared to the operating cash flows models in predicting future operating cash flows. All the three operating cash flows
models have the least predictive abilities for future operating cash flows when compared to the other models.

Table 4.19  Ranking of the models’ predictive abilities based on adjusted $R^2$

<table>
<thead>
<tr>
<th>Ranking</th>
<th>One year-lag model</th>
<th>Adj. $R^2$</th>
<th>Two years-lag model</th>
<th>Adj. $R^2$</th>
<th>Three years-lag model</th>
<th>Adj. $R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Operating cash flows combined with disaggregated accrual components</td>
<td>0.122</td>
<td>Operating cash flows combined with disaggregated accrual components</td>
<td>0.159</td>
<td>Operating cash flows combined with disaggregated accrual components</td>
<td>0.149</td>
</tr>
<tr>
<td>2</td>
<td>Operating cash flows combined with aggregated accruals</td>
<td>0.083</td>
<td>EBITDA</td>
<td>0.092</td>
<td>EBITDA</td>
<td>0.085</td>
</tr>
<tr>
<td>3</td>
<td>EBITDA</td>
<td>0.08</td>
<td>Operating cash flows combined with aggregated accruals</td>
<td>0.083</td>
<td>Operating cash flows combined with aggregated accruals</td>
<td>0.077</td>
</tr>
<tr>
<td>4</td>
<td>Earnings</td>
<td>0.057</td>
<td>Earnings</td>
<td>0.07</td>
<td>Earnings</td>
<td>0.054</td>
</tr>
<tr>
<td>5</td>
<td>Operating cash flows</td>
<td>0.032</td>
<td>Operating cash flows</td>
<td>0.03</td>
<td>Operating cash flows</td>
<td>0.045</td>
</tr>
</tbody>
</table>

Source: Developed from the regression results.

Overall, the operating cash flows combined with disaggregated accrual components models have the strongest abilities compared to the other models in predicting future operating cash flows for all three models examined. Hypothesis 6 is accepted. The ability of operating cash flows combined with disaggregated accrual components model is the most superior compared to earnings, operating cash flows, operating cash flows combined with aggregated accruals and EBITDA models in predicting the future operating cash flows of listed Malaysian industrial products manufacturing companies.

The abilities of operating cash flows combined with aggregated accruals models in predicting future operating cash flows were also superior to both the earnings and operating cash flows models for each of the one, two and three years-lag models examined. The predictive abilities of all the earnings models were superior to the operating cash flows models but the predictive abilities all the EBITDA models were
superior to both the earnings models and operating cash flows models in predicting future operating cash flows. The predictive abilities of the two and three-years lag EBITDA models were also superior to the operating cash flows combined with aggregated accruals models. The operating cash flows models have the weakest predictive ability in predicting future operating cash flows compared to the other models.

4.7.7 Validation of the regression models

This section examines the results from validating the regression models using two validation methods, as described in section 3.10.3. The first method derived an alternative adjusted $R^2$ from Stein’s formula, which is used to compare against the adjusted $R^2$ derived from SPSS. The second method utilised the holdout sample to investigate the validity and robustness of the regression models.

Method 1: Validation using Stein’s adjusted $R^2$

Stein’s formula provided an alternative adjusted $R^2$, which can be used to examine the cross validity strength of the regression model (Field 2009; Stevens 2002). Stein’s formula is computed as:

$$
\text{Adjusted } R^2 = 1 - \left[ \frac{n - 1}{n - k - 1} \left( \frac{n - 2}{n - k - 2} \left( \frac{n + 1}{n} \right) \right) \right] \left( 1 - R^2 \right)
$$

Where $n$ is the number of sample,

$k$ is the number of predictors and

$R^2$ is the unadjusted coefficient of determination.

Stein’s formula was used to compute an alternative adjusted $R^2$ and this was compared to the one derived from SPSS to assess the cross validity of the regression model. If the adjusted $R^2$ derived using Stein’s formula is consistent to the one derived from SPSS, then the cross validity of the model is good (Field 2009).
Table 4.20 summarised the results from computing Stein’s adjusted $R^2$ and the adjusted $R^2$ resulting from SPSS. Analysis of these results revealed that most of Stein’s adjusted $R^2$ for each model were similar to the adjusted $R^2$ derived from SPSS. However, there is a large difference for the three years-lag operating cash flows combined with disaggregated accrual components model between the adjusted $R^2$ derived from Stein’s formula ($\text{adjusted } R^2 = 0.0733$) and SPSS ($\text{adjusted } R^2 = 0.149$). Except for this three years-lag model, these findings indicate that the cross validity of the other prediction models are good. The findings are inconclusive for the three years-lag operating cash flows combined with disaggregated accrual components based on this method.

Table 4.20  Summary of adjusted $R^2$ using Stein’s formula and adjusted $R^2$ from SPSS

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Regression model</th>
<th>Adj. $R^2$ (Stein’s formula)</th>
<th>Adj. $R^2$ (SPSS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>One year-lag EARN</td>
<td>0.056</td>
<td>0.057</td>
</tr>
<tr>
<td>2</td>
<td>Two years-lag EARN</td>
<td>0.064</td>
<td>0.070</td>
</tr>
<tr>
<td>3</td>
<td>Three years-lag EARN</td>
<td>0.046</td>
<td>0.054</td>
</tr>
<tr>
<td>4</td>
<td>One year-lag CFO</td>
<td>0.030</td>
<td>0.032</td>
</tr>
<tr>
<td>5</td>
<td>Two years-lag CFO</td>
<td>0.026</td>
<td>0.03</td>
</tr>
<tr>
<td>6</td>
<td>Three years-lag CFO model</td>
<td>0.037</td>
<td>0.045</td>
</tr>
<tr>
<td>7</td>
<td>One year-lag CFO combine with aggregated accruals</td>
<td>0.078</td>
<td>0.083</td>
</tr>
<tr>
<td>8</td>
<td>Two years-lag CFO combine with aggregated accruals</td>
<td>0.075</td>
<td>0.083</td>
</tr>
<tr>
<td>9</td>
<td>Three years-lag CFO combine with aggregated accruals</td>
<td>0.063</td>
<td>0.077</td>
</tr>
<tr>
<td>10</td>
<td>One year-lag CFO combine with disaggregated accruals</td>
<td>0.110</td>
<td>0.122</td>
</tr>
<tr>
<td>11</td>
<td>Two years-lag CFO combine with disaggregated accruals</td>
<td>0.126</td>
<td>0.159</td>
</tr>
<tr>
<td>12</td>
<td>Three years-lag CFO combine with disaggregated accruals</td>
<td>0.073</td>
<td>0.149</td>
</tr>
<tr>
<td>13</td>
<td>One year-lag EBITDA</td>
<td>0.077</td>
<td>0.080</td>
</tr>
<tr>
<td>14</td>
<td>Two years-lag EBITDA</td>
<td>0.088</td>
<td>0.091</td>
</tr>
<tr>
<td>15</td>
<td>Three years-lag EBITDA</td>
<td>0.078</td>
<td>0.085</td>
</tr>
</tbody>
</table>

Source: Developed using Stein’s formula and SPSS regression results.
Method 2: Validation using holdout sample

The sample was subdivided into two sample sets, the within sample and the holdout sample. The within sample, which was selected for the period from 1999 to 2008, was used to develop the regression models and test the hypotheses while the holdout sample from the year 2009 was used to cross validate the prediction models.

Operating cash flows were predicted for the year 2009 from each of the regression models developed from the within sample. Significance tests were conducted on the Pearson correlation between the predicted operating cash flows and the actual operating cash flows from the holdout sample and the adjusted $R^2$ were evaluated to cross validate each regression model.

Table 4.21 summarized the results of the correlation coefficient ($R$) and adjusted $R^2$ from comparing the predicted operating cash flows with actual operating cash flows for each regression model. Table 4.25 analysis revealed that there were positive and highly significant ($p<0.01$) correlations between the predicted operating cash flows and the actual operating cash flows for all the models, indicating that the association between the predicted operating cash flows and the actual operating cash flows were very good. The correlation coefficients for the earnings model, the operating cash flows combined with the aggregated accruals model and the operating cash flows combined with the disaggregated accrual components model were approximately 0.5 ($p<0.01$) for most of the lagged years. These correlation coefficients were higher than the correlation coefficients derived for the operating cash flows and the EBITDA models, which ranged from 0.261 to 0.386 for the operating cash flows model and 0.314 to 0.345 for the EBITDA model ($p<0.01$).

The adjusted $R^2$ derived from comparing the predicted with the actual operating cash flows for the earnings, the operating cash flows combined with the aggregated/disaggregated accrual components models were mostly higher than the operating cash flows and the EBITDA models for all the models examined. These results
suggested that the robustness of these three models in predicting future operating cash flows are higher compared to the operating cash flows and the EBITDA models.

Table 4.21 Summary of the correlation coefficient and adjusted $R^2$ from comparison between predicted and actual operating cash flows

<table>
<thead>
<tr>
<th>No. of lagged years</th>
<th>Earnings model</th>
<th>Operating cash flows model</th>
<th>Operating cash flows combined with aggregated accruals model</th>
<th>Operating cash flows combined with disaggregated accrual components model</th>
<th>EBITDA model</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.532*</td>
<td>0.283</td>
<td>0.261*</td>
<td>0.068</td>
<td>0.549*</td>
</tr>
<tr>
<td>2</td>
<td>0.493*</td>
<td>0.243</td>
<td>0.386*</td>
<td>0.149</td>
<td>0.582*</td>
</tr>
<tr>
<td>3</td>
<td>0.505*</td>
<td>0.255</td>
<td>0.368*</td>
<td>0.136</td>
<td>0.540*</td>
</tr>
</tbody>
</table>

* Correlation highly significant at 0.01 level (2 tailed)

Source: Developed from regression results.

Overall, the results from method 1 using Stein’s formula to derive an alternative adjusted $R^2$ is consistent with the findings from using the SPSS adjusted $R^2$ for most of the prediction models. Method 2 revealed that the correlations between the predicted operating cash flows derived from the regression models and actual operating cash flows from the holdout sample were positive and highly significant ($p<0.01$) for all the prediction models. Comparing the adjusted $R^2$ derived from method 2 suggested that the earnings and operating cash flows combined with aggregated/disaggregated accruals models are more robust for future operating cash flows prediction relative to the operating cash flows and EBITDA models.
Additionally, the residuals derived from the regression models were analysed when testing each hypothesis in sections 4.7.1 to 4.7.5 to check that the four main regression assumptions, which are linearity, homoscedasticity, independence of residuals and normality of residuals, are not violated. This is to ensure that the regression results are valid and generalisations can be made about the population from conducting regression analysis on the sample (Levine et al. 2008). The results from the residual analysis indicated that these main assumptions are adhered.

These findings revealed that all the prediction models developed have higher than chance and adequately robust in predicting future operating cash flows. These models are valid and generalisable to other settings.

4.8 Conclusion

This chapter described the characteristics of the samples collected and reported on the descriptive statistics of the sample data. There were significant correlations between the dependent and the predictor variables, indicating that regressions can be conducted to test the models. Regressions were conducted based on the models developed from Chapter 3. The statistical regression results were analysed and the findings provided empirical evidence supporting the acceptance of all the hypotheses.

Past earnings, operating cash flows and operating cash flows combined with aggregated accruals or disaggregated accrual components and EBITDA were all highly significant in predicting future operating cash flows (p<0.01). Past earnings, operating cash flows and EBITDA have a significant positive relationship with future operating cash flows. Operating cash flows combined with disaggregated accrual components model has the strongest predictive abilities compared to the other models. Operating cash flows combined with aggregated accruals models are superior to both earnings and operating cash flows models for future operating cash flows prediction. The predictive abilities of all the EBITDA models were higher than both earnings and operating cash flows models while all the earnings models have stronger predictive abilities compared to operating cash flows models in predicting future operating cash flows. All the past operating cash
flows models have the least predictive strength for future operating cash flows compared to the other models.

From examining the relative contributions of each predictor within the prediction models, only the past one year earnings predictors within all the earnings models were significantly positive in predicting future operating cash flows. Most of the past one, two and three years of operating cash flows within all the operating cash flows models were significantly positive in predicting future operating cash flows. Including the past three years of operating cash flows enhanced the predictive abilities of the operating cash flows model. Only past one year operating cash flows and aggregated accruals predictors within all the operating cash flows combined with aggregated accruals models were significant in predicting future operating cash flows. Mainly past one year of operating cash flows and disaggregated accrual components predictors within all the operating cash flows combined with disaggregated accrual components models were significant in predicting future operating cash flows. Only past one and two years EBITDA were significantly positive in contributing toward future operating cash flows prediction. The prediction models were cross validated and adequately robust in applying across different settings.

In the following next chapter 5, the conclusions and implications from these findings are discussed within the context of relevant literature.
CHAPTER 5

Conclusions and Implications

5.1 Introduction

This study seeks to examine the comparative abilities of accrual-based accounting and operating cash flows information in predicting future operating cash flows within the Malaysian context. The research problem was “To what extent can historical earnings, operating cash flows, accruals and EBITDA accounting information predict the future operating cash flows of listed Malaysian industrial products manufacturing companies?”

Chapter one introduced the research background, research problem, outline of the research design and research justifications. Chapter two examined the extant literature relating to the research area to chart the body of knowledge, identify gaps in existing literature and thereafter illustrated the research problem and the research issues. The key areas examined were the development of Bursa Malaysia and the Malaysian financial reporting regulations, relevance of future operating cash flows prediction, the two parent disciplines (cash and accrual accounting principles) and the immediate discipline (comparative studies on the abilities of earnings, accruals and cash flows in predicting future operating cash flows). Capital market studies related to the research area on the comparative value relevance of accounting information and the ability of accounting information as predictors of corporate failure within the Malaysian context were also covered. Six research questions related to the research problem were developed and hypotheses were constructed to predict the answers to the research questions based on extant literature. Consistent with prior studies, regression models were developed as proxy for the prediction models using ordinary least squares method. The dependent variable was past operating cash flows while the predictors were past earnings, operating cash flows, aggregated accruals, disaggregated accrual components and EBITDA accounting information. Chapter three examined and justified the positivist paradigm and the methodology followed for data collection and hypotheses testing. The prediction
models in the form of regression models and the measurement of the variables were also described in this chapter. Chapter four described the sample collection, which was past reported accounting data for listed Malaysian industrial products manufacturing companies and the data preparation for analysis. The results from conducting the regressions, hypotheses statistical testing and the comparative predictive powers of the prediction models were also presented and evaluated in chapter four.

This chapter five demonstrates how the findings from chapter four fit into the context of extant literature described in chapter two and provides the conclusions and implications for this research. This chapter is structured into eight sections. The introduction is provided in section 5.1. The findings and conclusions from testing each hypothesis are discussed within the context of existing literature in section 5.2. The conclusions about the research problem are examined in section 5.3. The implications of the findings for theory are discussed in section 5.4 while the implications for policy and practice are examined in section 5.5. The limitations of this research are evaluated in section 5.6 while the implications for future research are provided in section 5.7. The summary of this chapter is discussed in section 5.8.

The structure of chapter 5 is illustrated in figure 5.1.
Figure 5.1  Chapter 5 Structure: Conclusions and Implications

5.1 Introduction

5.2 Conclusion about the Research Questions and Hypotheses

5.3 Conclusions about the Research Problem

5.4 Implications for Theory

5.5 Implications for Policy and Practice

5.6 Limitations

5.7 Implications for Future Research

5.8 Summary

Source: Developed for this study.
5.2 Conclusions about the Research Questions and Hypotheses

This section provides the conclusions from the data analysis, which was conducted in the previous chapter four, within the context of relevant literature for each of the hypotheses tested. The findings revealed that historical earnings, accruals, EBITDA and operating cash flows have significant abilities to predict future operating cash flows within the Malaysian context. However, each of this financial information has substantially different predictive strengths and implications for future operating cash flows prediction.

5.2.1 Hypothesis 1

Hypothesis 1, which predicts the answer to research question 1, posits that historical earnings have the significant ability to predict the future operating cash flows of listed Malaysian industrial products manufacturing companies. Three regression models comprising of one simple and two multiple linear regression models were developed to test this hypothesis. Operating cash flows, acting as proxy for future operating cash flows, were the dependent variable and past one, two and three years earnings were the independent variables. This approach was consistent with prior studies (such as Al-Attar and Hussain 2004; Barth et al. 2001; Chotkunakitti 2005; Habib 2010; Stammerjohan and Nassiripour 2001). The statistical results and the analysis from conducting these regressions were discussed in section 4.7.1.

Predictive strength of the earnings models

All the three earnings models comprising of past earnings predictors were highly significant in predicting future operating cash flows (p<0.01). These findings are consistent with prior studies, such as Barth, et al. (2001), Chotkunakitti (2005) and Habib (2010).

The predictive strengths of the models were differentiated. The two years-lag earnings model has the strongest predictive abilities (adjusted $R^2=0.07$) in predicting future operating cash flows compared to the one year-lag earnings model (adjusted $R^2=0.057$) and the three years-lag earnings model (adjusted $R^2=0.054$). This implied that additional two years-lag earnings predictor improved the predictive ability of the models but the
inclusion of the three years-lag earnings predictor caused the predictive ability to decline slightly. Although the predictive powers of these earnings models were low, ranging from 5.4% to 7% (adjusted R² ranged from 0.054 to 0.07), it was higher than the findings reported by Chotkunakitti (2005), which reported a range of 2% to 4% (adjusted R²). An explanation of this could be the difference between the period examined by Chotkunakitti (2005) and this study. Chotkunakitti (2005) evaluated the predictive ability of Thai listed companies for the period from 1994 to 2002, which covered an unstable period during the Asian financial crisis in 1997 and 1998. Consequently the reported earnings during these periods may be erratic and less reflective of the long term sustainable earnings. This study covered the period from 1999 to 2009, during which the economy is relatively more stable and less volatile, resulting in the explanatory powers of earnings higher than that reported by Chotkunakitti (2005).

Predictive ability of each one, two and three years-lag earnings predictor
Examining the relative contributions of each predictor within the earnings models revealed that only the one year-lag earnings predictors were positive and highly significant in predicting future operating cash flows for all the models (t value, p<0.01). The individual two years-lag and three years-lag earnings predictors were not significant in predicting future operating cash flows (t value, p>0.05). This revealed that earnings have significant predictive ability for one-year ahead future operating cash flows prediction, which is consistent with most prior studies, such as Ebaid (2011), Farshadfar et al. (2008), Habib (2010) and Waldron and Jordan (2010). However, these regression results suggested that past earnings beyond one year has minimal relevance and contribution in forecasting future operating cash flows. These results conflicted with Al-Attar and Hussain (2004), Barth et al. (2001) and Chotkunakitti (2005), which have documented that earnings are significant in predicting future operating cash flows at least up to three years. Nevertheless, these findings are consistent to Al-Attar and Hussain (2004), which have noted that the significance of the explanatory ability are reduced when the forecasting horizon increases, especially when predicting three years ahead operating cash flows.
Regression assumptions: Independence, normality, homoscedasticity and linearity

Four main regression assumptions were examined using residual analysis to ensure that these assumptions are not violated, as recommended by Field (2009) and Levine et al. (2008) and discussed in section 3.10.1. The Durbin-Watson statistics were close to 2, which indicated that the residuals arising from the regression models are independent and uncorrelated. Visual inspection of the histograms derived from the residuals against the normal distribution curve indicated normality distribution. Scatter-plot graphs derived from plotting the standardised residuals against the standardised predicted values were visually inspected. These graphs indicated that the residuals are randomly and evenly distributed, implying that the homoscedasticity and linearity assumptions are not violated. The regression results are valid and inferences made from the regression analysis based on the sample are generalisable to the population since these four main regression assumptions are adhered (Field 2009; Levine et al. 2008).

Key findings

All the three earnings models comprising of past one to three years of earnings information as predictors were highly significant in predicting future operating cash flows (p<0.01). Hypothesis 1 is accepted. Past earnings have the significant ability to predict the future operating cash flows of listed Malaysian industrial products manufacturing companies. These results are consistent with prior research, which was predominantly conducted in the United States and some other countries (such as Al-Attar and Hussain 2004; Austin and Andrew 1989, Barth et al. 2001; Charitou and Vafeas 1998, Dechow et al. 1998; Ebaid 2011; Francis 2008; Greenberg et al. 1986; Hollister et al. 2008; Kim and Kross 2005; Largay and Stickney 1980; Pae 2005; Waldron and Jordan 2010). These findings are also similar with recent related research within the Malaysia context which has documented that earnings have value relevance in explaining share market returns (Cheng and Mohamad 2008; Pirie and Smith 2008).

However, only the past one year of individual earnings predictor within all the earnings models were positive and highly significant in predicting future operating cash flows. The past two and three years of individual earnings predictors do not significantly
contribute towards future operating cash flows prediction for all the earnings models. These findings implied that individual earnings predictor have the significant ability to predict one year-ahead future operating cash flows but has minimal predictive powers when forecasting future operating cash flows beyond one year. Users of accounting information should emphasise primarily on past one year earnings when forecasting future operating cash flows and less focus on earlier years.

The key findings from testing hypothesis 1 are illustrated in figure 5.2.

**Figure 5.2 Key findings from testing hypothesis 1**

<table>
<thead>
<tr>
<th>EARNINGS MODELS</th>
<th>1 YEAR LAG</th>
<th>2 YEARS LAG</th>
<th>3 YEARS LAG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Future operating cash flows</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

**Legend**

- Represents prediction model that is significant in predicting future operating cash flows, which comprise of past one, two and three years of financial information as predictors.
- Represents individual predictor that is significant in predicting future operating cash flows, where $t=1, 2$ and $3$ refer to one, two and three years-lag respectively.
- Represents individual predictor that is insignificant in predicting future operating cash flows, where $t=1, 2$ and $3$ refer to one, two and three years-lag respectively.

Source: Developed for this study from regression results.
5.2.2 Hypothesis 2

Hypothesis 2, which predicts the answer to research question 2, posits that historical operating cash flows have the significant ability to predict the future operating cash flows of listed Malaysian industrial products manufacturing companies. Three regression models comprising of one simple and two multiple linear regression models were developed to test this hypothesis. Operating cash flows, acting as proxy for future operating cash flows, were the dependent variable and past combinations of one to three years of operating cash flows were the predictors. This approach is consistent with prior studies (such as Al-Attar and Hussain 2004; Barth et al. 2001; Chotkunakitti 2005; Habib 2010; Stammerjohan and Nassiripour 2001). The statistical results and the analysis from conducting these regressions were discussed in section 4.7.2.

Predictive strength of the operating cash flow models

The three operating cash flows regression models comprising of past operating cash flows predictors were all highly significant in predicting future operating cash flows (p<0.01). These findings were consistent with prior studies (such as Al-Attar and Hussain 2004; Barth et al. 2001, Bowen et al. 1986; Chotkunakitti 2005). The three years-lag operating cash flows model has the strongest predictive powers (adjusted $R^2=0.045$) in predicting future operating cash flows compared to the one year-lag model (adjusted $R^2=0.032$) and the two years-lag model (adjusted $R^2=0.03$). The two-years lag model has the weakest predictive powers for future operating cash flows prediction. These regression results revealed that the predictive ability of the operating cash flow model is enhanced when all past three years of operating cash flows are included.

Predictive ability of each one, two and three years-lag operating cash flows predictors

Evaluation of the relative contributions of each predictor ($CFO_{t-1}$, $CFO_{t-2}$ and $CFO_{t-3}$) within all the operating cash flows models revealed that most of the predictors (except for the two years-lag predictor, $CFO_{t-2}$, in the three years-lag operating cash flow model) were positive and highly significant in predicting future operating cash flows (t value, p<0.01). These results are consistent with Chotkunakitti (2005) and Habib (2010). The
findings also revealed that the predictive powers of the operating cash flows model peaked when the entire past three years of operating cash flows were included into the operating cash flow models. An explanation for this could be that operating cash flows suffer from timing and matching issues compared to earnings, which may cause distortion in performance measurement (Dechow 1994). However, these issues are likely to occur over a short term period but not over the long term. When operating cash flows are examined over a longer horizon period, the timing of cash receipts and cash payments tend to be more matched compared to the short term period and the overall reported total net operating cash flows is smoother and less erratic in the long term compared to the short term. Operating cash flows should eventually equalise to accruals over the life of the company since accruals are deferred receipts and payments resulted from recording the activities in the period in which the transaction occurred, irrespective of the timing of the cash flows. Consequently, total operating cash flows is expected to be less volatile over a longer period, such as three years, and more useful for predicting future operating cash flows.

**Regression assumptions: Independence, normality, homoscedasticity and linearity**

Residual analysis was conducted to ensure that the four main regression assumptions are adhered, as recommended by Field (2009) and Levine et al. (2008) and discussed in section 3.10.1. The Durbin-Watson statistics were close to 2, indicating that the residuals arising from the regression models are independent and uncorrelated. Visual inspection of the histograms derived from the residuals indicated normality distribution. Scatter-plot graphs derived from plotting the standardised residuals against the standardised predicted values implied that the homoscedasticity and linearity assumptions are not violated since the residuals are randomly and evenly distributed. The regression results are valid and inferences made from the regression analysis based on the sample are generalisable to the population since these four main regression assumptions are adhered (Field 2009; Levine et al. 2008).
Key findings

All the three operating cash flows models consisting of past one to three years of operating cash flows information as predictors were highly significant in predicting future operating cash flows ($p<0.01$). Hypothesis 2 is accepted. Past operating cash flows have the significant ability to predict the future operating cash flows of listed Malaysian industrial products manufacturing companies. These findings are consistent with prior research (such as Al-Attar and Hussain 2004; Arthur et al. 2007; Barth et al. 2001, Bowen et al. 1986, Chotkunakitti 2005, Dechow et al. 1998, Greenberg et al. 1986, Habib 2010; Kim and Kross 2005; Seng 2006). These findings are also consistent with recent related research in Malaysia, which has indicated that past cash flows information has value relevance in explaining share market returns (Cheng and Mohammad 2008).

Examining each predictor within the three operating cash flows models revealed that most of the past one, two and three years of operating cash flows predictors were highly significant and positive in predicting future operating cash flows variation ($t$ value, $p<0.01$). This revealed that past operating cash flows information is relevant in predicting up to three years-ahead operating cash flows within the Malaysian context. Hence, users of operating cash flows information should emphasise on the past three years of operating cash flows information when forecasting future operating cash flows.

The key findings from testing hypothesis 2 are illustrated in figure 5.3.
Figure 5.3  Key findings from testing hypothesis 2

OPERATING CASH FLOWS MODELS

<table>
<thead>
<tr>
<th>LAG</th>
<th>Prediction Models</th>
<th>t=1, 2, 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 YEAR</td>
<td></td>
<td>t=1</td>
</tr>
<tr>
<td>2 YEARS</td>
<td></td>
<td>t=1, 2</td>
</tr>
<tr>
<td>3 YEARS</td>
<td></td>
<td>t=1, 2, 3</td>
</tr>
</tbody>
</table>

Future operating cash flows

Legend
- Green bar: Represents prediction model that is significant in predicting future operating cash flows, which comprise of past one, two and three years of financial information as predictors.
- Green circle: Represents individual predictor that is significant in predicting future operating cash flows, where t=1, 2 and 3 refer to one, two and three years-lag respectively.

Source: Developed for this study from regression results.

5.2.3 Hypothesis 3
Hypothesis 3, which predicts the answer to research question 3, posits that historical operating cash flows combined with aggregated accruals have the significant ability to predict the future operating cash flows of listed Malaysian industrial products manufacturing companies. Three regression models comprising of one simple and two multiple linear regression models were developed to test this hypothesis. Operating cash flows, acting as proxy for future operating cash flows, were the dependent variable. Past one, two and three years-lag operating cash flows and aggregated accruals were the predictors. This approach is consistent with prior studies (Al-Attar and Hussain 2004; Barth et al. 2001; Chotkunakitti 2005; Stammerjohan and Nassiripour 2001). The
statistical results and the analysis from conducting these regressions were discussed in section 4.7.3.

**Predictive strength of the operating cash flows combined with aggregated accruals models**

The three prediction models comprising of past operating cash flows and aggregated accruals predictors were all highly significant ($p<0.01$) in predicting future operating cash flows. Both the one year-lag model and the two years-lag model have the same predictive abilities (adjusted $R^2=8.3\%$) for future operating cash flows while the three years-lag model has the weakest predictive abilities (adjusted $R^2=7.7\%$). These results are consistent with Chotkunakitti (2005). These regression results also suggested that including three years-lag operating cash flows and accruals predictors caused the predictive ability of the operating cash flows combined with aggregated accruals model to decline.

**Predictive ability of each one, two and three years-lag operating cash flows and aggregated accruals predictors**

When examining the relative contributions of each predictor within all the prediction models, only the one year-lag operating cash flows and aggregated accruals predictors were positive and highly significant in predicting future operating cash flows ($t$ value, $p<0.01$). The two years-lag and three-years lag predictors were not significant in predicting future operating cash flows ($t$ value, $p>0.05$). These results revealed that past operating cash flows combined with aggregated accruals information have minimal relevance when forecasting beyond one year of future operating cash flows.

Persistency means the degree in which the current period components transpire again in future periods (Francis and Smith 2005, p.414). These findings implied that aggregated accruals are less persistent beyond one year of past operating cash flows. These findings are similar to prior studies that have documented that accruals are less persistent into future earnings compared to cash components (Dechow and Dichev 2002; Dechow and Ge 2006; Dechow et al. 2008; Fairfield et al. 2003b; Sloan 1996; Xie 2001), as discussed
in section 2.6.1.2. An explanation for the less persistence of accruals into longer periods may be due to the poor quality of accruals caused by estimation errors (Dechow and Dichev 2002; Richardson et al. 2005) or intentional opportunistic manipulations (Richardson et al. 2006; Sloan 1996; Xie 2001). The lower persistence of accruals into future periods could be caused by discretionary accruals that required management judgments, such as depreciation and provisions for contingent liabilities (Xie 2001). If earnings are manipulated, the accruals will reverse in the following year and become less persistent into future periods (Sloan 1996; Xie 2001). An alternative explanation for the less persistency of accruals could be due to economic growth factors, such as diminishing marginal returns from increasing investments (Anderson et al. 2006; Cooper et al. 2005; Fairfield et al. 2003b; Khan 2005; Titman et al. 2004; Zach 2005). Other possible explanation is that the accruals are mainly relating to working capital changes, such as accounts receivable changes, accounts payable changes and inventory changes, which are mainly short term in nature. These accruals should crystallise into operating cash flows within the following year and hence, less persistent into later years. Consequently, the contribution from short term accruals realising into future operating cash flows is expected to diminish beyond one year.

Regression assumptions: Independence, normality, homoscedasticity and linearity

Four main regression assumptions were examined using residual analysis to ensure that these assumptions are adhered, as recommended by Field (2009) and Levine et al. (2008) and discussed in section 3.10.1. The Durbin-Watson statistics were close to 2, indicating that the residuals arising from the regression models are independent and uncorrelated. Visual inspection of the histograms developed from the residuals indicated normality distribution. Scatter-plot graphs were derived from plotting the standardised residuals against the standardised predicted values. Visual inspection of these graphs indicated that the residuals are randomly and evenly distributed, implying that the homoscedasticity and linearity assumptions are adhered. The regression results are valid and inferences made from the regression analysis based on the sample are generalisable to the population since these four main regression assumptions are adhered (Field 2009; Levine et al. 2008).
Key findings
The three models comprising of one to three years of past operating cash flows and aggregated accruals as predictors were all highly significant in predicting future operating cash flows (p<0.01). Hypothesis 3 is accepted. Past operating cash flows combined with aggregated accruals have the significant ability to predict the future operating cash flows of listed Malaysian industrial products manufacturing companies. These results are consistent with prior studies (Al-Attar and Hussain 2004; Barth et al. 2001; Chotkunakitti 2005; Ebaid 2011; Stammerjohan and Nassiripour 2001). These findings also provided empirical support to prior capital market studies, which have reported that accruals have incremental value in explaining share market returns (Guay et al. 1996; Subramanyam 1996).

However, only the one year-lag operating cash flows and one year-lag aggregated accruals predictors within the models were positive and highly significant in predicting future operating cash flows for all the models (t value, p<0.01). Past two and three years operating cash flows and aggregated accruals predictors were not significant in predicting future operating cash flows (t value, p>0.05). These findings revealed that operating cash flows combined with aggregated accruals are only useful in predicting one year-ahead cash flows and have less relevance for forecasting future operating cash flows beyond one year. This implied that the accruals reported by listed Malaysian industrial products manufacturing firms are mainly short term in nature, most likely to reverse or realise into operating cash flows within one year and less persistence beyond one year. Consequently, users of accounting information should primarily focus only on past one year aggregated accruals information when combining with operating cash flows to forecast future operating cash flows. Such past financial information has minimal relevance towards forecasting beyond one year of future operating cash flows.

The key findings from testing hypothesis 3 are illustrated in figure 5.4.
5.2.4 Hypothesis 4

Hypothesis 4 predicts the answer to research question 4. It posits that historical operating cash flows combined with disaggregated accrual components have the significant ability to predict the future operating cash flows of listed Malaysian industrial products manufacturing companies. Three regression models comprising of one simple and two multiple linear regression models were developed to test this hypothesis. Operating cash flows, acting as proxy for future operating cash flows, were the dependent variable and past one, two and three years operating cash flows combined with disaggregated accrual components (accounts receivable changes, accounts payable changes, inventory changes, other accruals and depreciation and amortization expenses) were the predictors. This
approach is consistent with prior studies (Al-Attar and Hussain 2004; Barth et al. 2001; Chotkunakitti 2005; Stammerjohan and Nassiripour 2001). The statistical results and the analysis from conducting these regressions were discussed in section 4.7.4.

**Predictive strength of the operating cash flows combined with disaggregated accrual components models**

All the three prediction models comprising of operating cash flows and disaggregated accrual components as predictors were all highly significant (p<0.01) in predicting future operating cash flows. These findings are consistent with Al-Attar and Hussain (2004) and Chotkunakitti (2005). The two years-lag model has the strongest prediction powers (adjusted $R^2=0.159$) for future operating cash flows compared to the one year-lag model (adjusted $R^2=0.122$) and the three years-lag model (adjusted $R^2=0.149$). The weakest prediction model was the one year-lag model. This implied that additional two years-lag operating cash flows and disaggregated accrual components predictors increased the predictive abilities while the additional three years-lag operating cash flows and disaggregated accrual components predictors caused the predictive ability of the model to decline.

**Predictive ability of each one, two and three years-lag operating cash flows combined with disaggregated accrual components**

Examining the relative contributions of each predictor within the three prediction models, most of the significant predictors were the one year-lag predictors for all the models. The direction of the accrual components was mixed and dependent on the individual accrual component. Consistent with Barth et al. (2001) and Chotkunakitti (2005), the past one year-lag operating cash flows ($CFO_{t-1}$), inventory changes ($INV_{t-1}$) and accounts receivable changes ($AR_{t-1}$) predictors were positive and highly significant (p<0.01) in predicting future operating cash flows for all three models. The one-year lag depreciation and amortization ($DEPRM_{t-1}$) predictor was negative and significant in predicting future operating cash flows for only the one year-lag model. The one year-lag accounts payable ($AP_{t-1}$) predictor was positive and significant in predicting future operating cash flows for the one and two years-lag models. The negative sign of $DEPRM_{t-1}$ and positive sign of
AP\(_{t-1}\) were inconsistent with Barth et al. (2001), which reported that DEPRM\(_{t-1}\) was positive while AP\(_{t-1}\) was negative. These conflicting findings could be due to the differences between the characteristics of firms examined in this study and those examined by Barth et al. (2001), which was conducted in the United States. Most of the two years-lag predictors (except for inventory changes variable, INV\(_{t-2}\), in the two years-lag model) and all the three years-lag predictors within all the models were insignificant in predicting future operating cash flows (t value, p>0.05). These findings indicated that operating cash flows and disaggregated accrual components have significant predictive ability mainly for one year-ahead operating cash flows but less able to forecast beyond one year.

These results have revealed that disaggregated accrual components are less persistent beyond one year of future operating cash flows. The less persistence of disaggregated accrual components beyond one year could be due to the poor accrual quality caused by estimation errors (Dechow and Dichev 2002; Richardson et al. 2005) or opportunistic manipulations (Richardson et al. 2006; Sloan 1996; Xie 2001). Other possible explanations are economic growth factors such as diminishing marginal returns from increasing investments (Anderson et al. 2006; Cooper et al. 2005; Fairfield et al. 2003b; Khan 2005; Titman et al. 2004; Zach 2005) or the short term nature of accruals as it can predominantly consist of working capital changes that crystallise into operating cash flows within one year.

The predictive abilities of the operating cash flows combined with disaggregated accrual components model were revealed by this study to decline with increasing prediction horizon. This is consistent with Al-Attar and Hussain (2004), which have reported that the ability of the disaggregated earnings model for future operating cash flows prediction reduces when the forecasting period increases.
Regression assumptions: Independence, normality, homoscedasticity and linearity

Four main regression assumptions were evaluated using residual analysis to ensure that these are not violated, as recommended by Field (2009) and Levine et al. (2008) and discussed in section 3.10.1. The Durbin-Watson statistics were close to 2, which indicated that the residuals arising from the regression models are independent and uncorrelated. Visual inspection of the histograms developed from the residuals indicated normality distribution. Scatter-plot graphs derived from plotting the standardised residuals against the standardised predicted values were visually inspected. These graphs indicated that the residuals are randomly and evenly distributed, implying that the homoscedasticity and linearity assumptions are not violated. The regression results are valid and inferences made from the regression analysis based on the sample are generalisable to the population since these four main regression assumptions are adhered (Field 2009; Levine et al. 2008).

Key findings

The three models comprising of both past one to three years of operating cash flows and disaggregated accrual components as predictors are all highly significant in predicting future operating cash flows. Hypothesis 4 is accepted. Historical operating cash flows combined with disaggregated accrual components have the significant ability to predict the future operating cash flows of listed Malaysian industrial products manufacturing companies. These findings are consistent with prior research (Al-Attar and Hussain 2004; Barth et al. 2001; Chotkunakitti 2005; Stammerjohan and Nassiripour 2001). These findings are also similar to prior capital market research, which has documented that disaggregated accrual components, specifically discretionary and non-discretionary components, are associated with share market returns (Guay et al. 1996; Pae 2005; Subramanyam 1996).

However, only the past one year of the operating cash flows and individual disaggregated accrual components predictors within the models were significant in predicting future operating cash flows for all the models. Most of the past two years and all the past three years predictors within all the models were insignificant in predicting future operating
This implied that past individual accruals components have the incremental ability to predict one-year ahead operating cash flows when combine with operating cash flows but this predictive abilities diminish when forecasting future operating cash flows beyond one year. This suggested that the nature of accruals reported by listed Malaysian firms are mainly short term, likely to reverse or realized into cash flows less than one year and less persistence into future operating cash flows beyond one year. Users of accounting information should mainly emphasise on the past one year of such accounting information and less on prior years information exceeding one year when forecasting future operating cash flows.

The key findings from testing hypothesis 4 are illustrated in figure 5.5.

**Figure 5.5 Key findings from testing hypothesis 4**

OPERATING CASH FLOWS COMBINED WITH DISAGGREGATED ACCRUAL COMPONENTS MODELS

- **1 YEAR LAG**: Represents prediction model that is significant in predicting future operating cash flows, which comprise of past one year of financial information as predictors.
- **2 YEARS LAG**: Represents individual predictor that is significant in predicting future operating cash flows, where \( t = 1, 2 \) refer to one and two years-lag respectively.
- **3 YEARS LAG**: Represents individual predictor that is significant in predicting future operating cash flows, where \( t = 1, 2, 3 \) refer to one, two and three years-lag respectively.

Source: Developed for this study from regression results.
5.2.5 Hypothesis 5

Hypothesis 5, which predicts the answer to research question 5, posits that EBITDA have the significant ability to predict the future operating cash flows of listed Malaysian industrial products manufacturing companies. Three regression models comprising of one simple and two multiple linear regression models were developed to test this hypothesis. Operating cash flows, acting as proxy for future operating cash flows, were the dependent variable and past one, two and three years EBITDA were the independent variables. The statistical results and the analysis from conducting these regressions were discussed in section 4.7.5.

Predictive strength of the EBITDA models

All the three prediction models comprising of past EBITDA predictors were highly significant (p<0.01) in predicting future operating cash flows. The two years-lag EBITDA model has the strongest predictive abilities (adjusted R²=0.092) for future operating cash flows compared to the one year-lag EBITDA model (adjusted R²=0.08) and the three years-lag EBITDA model (adjusted R²=0.085). The one year-lag EBITDA model has the weakest abilities for future operating cash flows prediction. These regression results revealed that the inclusion of the two years-lag EBITDA predictor increased the explanatory powers of the models but the additional three years-lag EBITDA predictor caused the predictive ability of the model to decline.

Predictive ability of each one, two and three years-lag EBITDA

Examining further the relative contributions of each predictor within the three models, only the one year-lag and two years-lag EBITDA predictors were positive and significant (p<0.05) in predicting future operating cash flows for all the EBITDA models. The three years-lag EBITDA predictor was insignificant in predicting future operating cash flows (p>0.05). These findings suggested that past EBITDA beyond two years have minimal ability in predicting future operating cash flows. A possible explanation could be that the explanatory ability is reduced due to the increase in the forecasting horizon (Al-Attar and Hussain 2004).
Regression assumptions: Independence, normality, homoscedasticity and linearity

Using residual analysis, four main regression assumptions were check to ensure that these assumptions are adhered, as recommended by Field (2009) and Levine et al. (2008) and discussed in section 3.10.1. The Durbin-Watson statistics were close to 2, indicating that the residuals arising from the regression models are independent and uncorrelated. Visual inspection of the histograms developed from the residuals against the normal distribution curve indicated normality distribution. Scatter-plot graphs derived from plotting the standardised residuals against the standardised predicted values were visually inspected. The residuals appeared random and evenly distributed, indicating that the homoscedasticity and linearity assumptions are not violated. The regression results are valid and inferences made from the regression analysis based on the sample are generalisable to the population since these four main regression assumptions are not violated (Field 2009; Levine et al. 2008).

Key findings

All the three models comprising of past one to three years of EBITDA as predictors were significant in predicting future operating cash flows (p<0.01). Hypothesis 5 is accepted. EBITDA have the significant ability to predict the future operating cash flows of listed Malaysian industrial products manufacturing companies.

However, only the past one and two years of EBITDA predictors within the EBITDA models were positive and significant in predicting future operating cash flows for all the EBITDA models (t value, p<0.05). This implied that past EBITDA are relevant and able to predict only up to two years-ahead operating cash flows but have minimal predictive abilities when forecasting beyond two years. Consequently, users of accounting information should only focus on historical one to two years of EBITDA when forecasting future operating cash flows.

This research provides empirical evidence that historical EBITDA are relevant and have the significant predictive ability for future operating cash flows. These findings are consistent and provide further empirical evidence supporting related capital market
studies that have associated EBITDA with share market returns, such as Florou and Chalevas (2010) and Misund et al. (2005). These studies have documented that EBITDA have value relevance in explaining share market returns and is recognized as a key performance measurement of operational activities in driving value (Florou and Chalevas 2010) and often used as proxy for cash flow from operations or basis for estimating cash flows when conducting valuation exercise (Berk et al. 2009; Berk et al. 2011; Misund et al. 2005).

The key findings from testing hypothesis 5 are illustrated in figure 5.6.

**Figure 5.6  Key findings from testing hypothesis 5**

EBITDA MODELS

| 1 YEAR LAG | 1 |
| 2 YEARS LAG | 1 | 2 |
| 3 YEARS LAG | 1 | 2 | 3 |

Future operating cash flows

**Legend**

- Represents prediction model that is significant in predicting future operating cash flows, which comprise of past one, two and three years of financial information as predictors.
- Represents individual predictor that is significant in predicting future operating cash flows, where \( t = 1, 2 \) and \( 3 \) refer to one, two and three years-lag respectively.
- Represents individual predictor that is insignificant in predicting future operating cash flows, where \( t = 1, 2 \) and \( 3 \) refer to one, two and three years-lag respectively.

Source: Developed for this study from regression results.
5.2.6 Hypothesis 6

Hypothesis 6 predicts the answer to research question 6. It posits that the ability of operating cash flows combined with disaggregated accrual components model is the most superior compared to earnings, operating cash flows, operating cash flows combined with aggregated accruals and EBITDA models in predicting the future operating cash flows of listed Malaysian industrial products manufacturing companies.

The relative explanatory strength of each regression model was examined by comparing the adjusted $R^2$ value for each of the models. The higher is the adjusted $R^2$ value, the stronger is the predictive abilities of the model. This approach is consistent with prior studies (such as Al-Attar Hussain 2004; Barth et al. 2001; Chotkunakitti 2005; Ebaid 2011; Stammerjohan and Nassiripour 2001). Based on the adjusted $R^2$, the comparative predictive abilities of the models for future operating cash flows was ranked and summarized in Table 4.19 in the previous chapter.

Comparing the predictive abilities based on adjusted $R^2$ across all the models as described in section 4.7.6 revealed that all the earnings models have superior predictive abilities compared to the operating cash flows models while the predictive abilities of all the EBITDA models were superior to both the earnings and operating cash flows models. Furthermore, the predictive abilities of the two years-lag and three years-lag EBITDA models exceeded the operating cash flows combined with the aggregated accruals model. These results indicated that the predictive abilities of the EBITDA model strengthened when additional past EBITDA information were included. All the operating cash flows models have the weakest abilities in predicting future operating cash flows when compared to the other models.

When aggregated accruals are combined with operating cash flows, the combined model is superior to both the earnings and the operating cash flows models in predicting future operating cash flows. These findings revealed that accruals have incremental explanatory powers beyond operating cash flows. Furthermore, all the models that have both the past operating cash flows and disaggregated accrual components have the strongest
explanatory powers in predicting the future operating cash flows for all the three years prediction horizon examined. These findings revealed that disaggregated accrual components have incremental explanatory powers exceeding aggregated accruals.

Disaggregating earnings into the components of operating cash flows and aggregated accruals enhanced the predictive ability for future operating cash flows compared to aggregated earnings. Furthermore, disaggregating the aggregated accruals into the individual accrual components strengthened further the predictive abilities for future operating cash flows. These findings are within expectations and consistent with prior studies, such as Al-Attar and Hussain (2004), Barth et al. (2001) and Ebaid (2011). An explanation for this is that different components embedded in earnings have different contributions to future operating cash flows. Aggregated earnings masked the effects of each component of earnings. Disaggregating earnings into the individual components of operating cash flows and aggregated accruals and further decomposing the aggregated accruals into individual accrual components unmask the different contributions for each component (Barth et al. 2001; Ebaid 2011).

These findings provide empirical evidence substantiating the importance of accruals within the Malaysian context as a means of mitigating the matching and timing issues existing within cash flows. These findings are also consistent with numerous literature and accounting standards that the accrual accounting process improves the usefulness of historical operating cash flows information for making economic decisions (Birt et al. 2008; Cheng, et al. 1997b; Chotkunakitti 2005; Dechow 1994; FASB 1978; IASB 2001; MASB 2011; Penham and Yehuda 2009).

Past earnings are also confirmed as superior predictors of future operating cash flows compared to past operating cash flows. This is consistent with prior studies that were conducted in other countries (such as Charitou and Vafeas 1998; Dechow et al. 1998; Ebaid 2011; Finger 1994; Greenberg et al. 1986; Kim and Kross 2005; Largay and Stickney 1980; Murdoch and Krause 1989, 1990; Pae 2005). These findings are also consistent with recent related research in Malaysia that has documented that earnings are
more value relevant than cash flows in the explaining share market returns over the short, medium and long term period (Cheng and Mohamad 2008).

These findings also confirm the role of EBITDA as a superior performance measurement compared to earnings and cash flows when forecasting future operating cash flows for valuation purposes. It provides supporting empirical evidence justifying the emphasis placed by financial analysts and investors on the importance of EBITDA as an alternative performance measurement and valuation construct.

**Key findings**

The model comprising of both operating cash flows and disaggregated accrual components is the most superior compared to earnings, operating cash flows, operating cash flow combined with aggregated accruals and EBITDA models in predicting the future operating cash flows of listed Malaysian industrial products manufacturing companies. Hypothesis 6 is accepted. Disaggregating earnings into the operating cash flows and accrual components of earnings enhance the predictive ability of earnings and disaggregating accruals into the individual accrual components strengthened further the predictive ability for future operating cash flows. This suggests that accruals have incremental information content beyond that contained within operating cash flows only. Disaggregated accrual components also have incremental explanatory powers in addition to that contained in aggregated accruals. These findings are consistent with prior studies, which were conducted in other countries (Al-Attar and Hussain 2004; Barth et al. 2001; Ebaid 2011).

Additionally, the predictive abilities of earnings model are superior to operating cash flows model but the predictive abilities of EBITDA model are superior to both earnings and the operating cash flows models for all the three years prediction horizon examined. Operating cash flows model have the least predictive abilities for future operating cash flows. These findings revealed that accrual-based accounting information is superior to operating cash flows information in forecasting future operating cash flows. Furthermore, EBITDA are revealed as a better alternative performance measurement when evaluating
the ability of companies to generate future operating cash flows compared to earnings and operating cash flows.

5.2.7 Validation of the regression models

Two methods were employed to evaluate the cross validity of the regression models. For the first method, an alternative adjusted $R^2$ was derived using Stein’s formula to compare against the adjusted $R^2$ derived from SPSS, as recommended by Stevens (2002) and Field (2009). For the second method, the models were validated by testing the significance of Pearson’s correlations between the predicted operating cash flows derived from each regression model and the actual operating cash flows from the holdout sample and evaluating the adjusted $R^2$. The validation test results were described in section 4.7.7.

The findings from the first method revealed that the alternative Stein’s adjusted $R^2$ for most of the prediction models were very similar to the ones computed by SPSS, which indicated that the cross-validity is good. For the second method, Pearson’s correlations between the predicted operating cash flows and the actual operating cash flows were positive and highly significant ($p<0.01$) for all the models, indicating that the association between the predicted and actual operating cash flows are very good. Furthermore, the adjusted $R^2$ from the second method for the earnings and operating cash flows combined with aggregated/disaggregated accruals models were higher than for the operating and EBITDA models. This suggested that the three models are more robust than the operating cash flows and EBITDA models for future operating cash flows prediction.

Analysing the residuals derived from the regressions revealed that the four main regression assumptions as described in section 3.10.1, which are linearity, homoscedasticity, independence of residuals and normality of residuals, are adhered for all the regression models. The Durbin-Watson statistics were close to 2 for all the models, indicating that there is no serial autocorrelation and the residuals are independent. Visual inspection of the histograms developed from the residuals revealed that the residuals have normal distribution for all the models. Scatter-plot graphs from plotting standardised residuals against the standardised predicted values for all the models appeared randomly
and evenly distributed, suggesting that the linearity and homoscedasticity assumptions are not violated. Since these assumptions are adhered, the regression results are valid and generalisations can be made about the population based on the regression analysis conducted on the sample (Field 2009; Levine et al. 2008).

These findings revealed that the prediction models developed in this study are valid and have higher than chance in predicting the future operating cash flows of listed Malaysian industrial products manufacturing companies. These models are robust and generalisable for future operating cash flows prediction across several years.

5.3 Conclusions about the Research Problem

The research problem is: “To what extent can historical earnings, operating cash flows, accruals and EBITDA accounting information predict the future operating cash flows of listed Malaysian industrial products manufacturing companies?”

This study initially examined separately the ability of past one, two and three years information for each past earnings, operating cash flows, operating cash flows combined with aggregated accruals, operating cash flows combined with disaggregated accrual components and EBITDA information in predicting future operating cash flows. Hypotheses based on extant literature were constructed and fifteen separate regression models, as proxies for prediction models, were developed to test each hypothesis. The findings from the regressions and hypothesis testing were examined to assess the comparative predictive abilities of each prediction model.

Historical earnings, operating cash flows, accruals and EBITDA are confirmed to have significant abilities in predicting the future operating cash flows for listed Malaysian industrial products manufacturing companies. Such financial information are confirmed by this study as highly relevant in forecasting future operating cash flows, which is consistent with expectations and prior studies conducted in other countries (such as Al-Attar and Hussain 2004; Barth et al. 2001; Chotkunakitti 2005; Ebaid 2011; Waldron and Jordan 2010). Nevertheless, the extent these accounting and operating cash flows
information are able to predict future operating cash flows within the Malaysian context deviate substantially.

Past one year of earnings information have the positive and significant ability to predict future operating cash flows. However, past two and three years of earnings information is insignificant and has minimal contribution towards predicting future operating cash flows. Hence, emphasis should be placed predominantly on past one year of earnings information when forecasting future operating cash flows.

At least up to three years of past operating cash flows information are useful for future operating cash flows prediction as these were found to be positive and significant in predicting future operating cash flows. The predictive ability of the operating cash flows are also revealed to strengthen when all past three years of operating cash flows are used. This implied that all past three years of operating cash flows should be considered when forecasting future operating cash flows.

Similar to earnings, only the past one year aggregated/disaggregated accrual components have the significant predictive abilities for future operating cash flows. Past two and three years of aggregated/disaggregated accruals were revealed to be insignificant in predicting future operating cash flows. These findings revealed that accruals is mainly relevant for forecasting one year-ahead operating cash flows when combined with operating cash flows but has marginal abilities in predicting beyond one year of future operating cash flows. This implies that the nature of accruals reported by Malaysian listed companies tend to be short term, reverses or realise into operating cash flows within one year and less persistent beyond one year of future operating cash flows. Hence, the focus should predominantly on past one year of aggregated/disaggregated accruals combining with operating cash flows when forecasting future operating cash flows.

Only the past one and two years of EBITDA information were positive and significant in predicting future operating cash flows, revealing that past EBITDA information is useful only for predicting up to two years-ahead future operating cash flows. Hence, emphasis
should be placed mainly on past one to two years of EBITDA information when forecasting future operating cash flows.

Examining the adjusted $R^2$ to evaluate the comparative predictive abilities of the models revealed that the model comprising of both operating cash flows and aggregated accruals have stronger predictive abilities compared to the earnings and operating cash flows model. This suggested that disaggregating earnings into components of operating cash flows and accruals enhance the predictive abilities compared to aggregated earnings. Accruals have incremental explanatory powers beyond that contained in operating cash flows alone. Furthermore, the model consisting of both operating cash flows and disaggregated accrual components has the strongest predictive abilities compared to the earnings, operating cash flows, operating cash flows combined with aggregated accruals and EBITDA models for future operating cash flows. This revealed that disaggregating the aggregated accruals into the individual accrual components strengthened further the predictive abilities for future operating cash flows. Disaggregated accrual components have incremental explanatory powers beyond that provided by aggregated accruals. These findings are consistent with prior studies, which were conducted in other countries (Al-Attar and Hussain 2004; Barth et al. 2001; Ebaid 2011). An explanation for this is that the components of aggregated earnings have different implications to future operating cash flows. Aggregated earnings mask the effects of these components. Disaggregating earnings into the individual components of operating cash flows and aggregated accruals and further disaggregating the accruals into individual accrual components enable the different weights and contributions for each accrual component to occur (Barth et al. 2001; Ebaid 2011).

Earnings have stronger abilities compared to operating cash flows in predicting future operating cash flows throughout the three years prediction horizon examined. However, EBITDA have superior predictive abilities compared to both earnings and operating cash flows across all the three years of prediction horizon evaluated. Furthermore, when more than past one year of EBITDA information is included in the model, the predictive strength of the EBITDA model is further enhanced such that it is also superior to
operating cash flows model combined with the aggregated accruals model. Operating cash flows models have the least predictive ability for future operating cash flows prediction throughout the three years prediction horizon. Based on these findings, users of financial statements should consider EBITDA as a superior alternative performance indicator than earnings and operating cash flows when assessing the ability of companies to generate future operating cash flows.

The regression models developed from this study are valid, adequately robust and generalisable for predicting the future operating cash flows of listed Malaysian industrial manufacturing companies for several years. This can be used to forecast future operating cash flows for the listed Malaysian companies within the industrial products manufacturing sector.

In summary, the findings consistently revealed that accrual-based accounting measures are superior to cash-based accounting measures for future operating cash flows prediction. Disaggregating earnings into operating cash flows and accruals improves the predictive ability for future operating cash flows compared to aggregated earnings. Accruals have incremental explanatory powers beyond that provided by operating cash flows alone. Operating cash flows combined with disaggregated accrual components have the strongest predictive abilities compared to earnings, operating cash flows, operating cash flows combined with aggregated earnings or EBITDA. These results suggested that disaggregating the aggregated accruals into the individual accrual components strengthens further the predictive ability for future operating cash flows. Disaggregated accrual components have incremental information content relative to aggregated accruals.

The extent past accrual-based accounting and operating cash flows information are able to predict future operating cash flows vary from one to three years. As individual predictors, both past earnings and aggregated/disaggregated accruals have the significant abilities to predict up to only one year-ahead (short term) future operating cash flows, past EBITDA can significantly predict up to two years-ahead (medium term) and past
operating cash flows can significantly predict up to three years-ahead (long term). Table 5.1 summarises the key findings and conclusions from this study.
### Table 5.1 Summary of the key findings and conclusions

<table>
<thead>
<tr>
<th>Hypothesis testing</th>
<th>Findings and conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hypothesis 1 testing:</strong></td>
<td></td>
</tr>
<tr>
<td>Earnings model.</td>
<td>1. Past earnings have the significant ability and positively predict future operating cash flows.</td>
</tr>
<tr>
<td></td>
<td>2. All three earnings prediction models are significant in predicting future operating cash flows and generalisable to other settings.</td>
</tr>
<tr>
<td></td>
<td>3. The two years-lag earnings prediction model consisting of past one and two years of earnings has the strongest prediction powers.</td>
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<tr>
<td></td>
<td>4. Further evaluation on the relative contributions of individual past one, two and three years of earnings predictors within all the prediction models revealed that only past one year of earnings significantly and positively predict future operating cash flows.</td>
</tr>
<tr>
<td></td>
<td>5. Past two and three years of earnings have minimal relevance when forecasting future operating cash flows.</td>
</tr>
<tr>
<td></td>
<td>6. Focus should be mainly on past one year of earnings when forecasting future operating cash flows.</td>
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<tr>
<td><strong>2. Hypothesis 2 testing:</strong></td>
<td></td>
</tr>
<tr>
<td>Operating cash flows model.</td>
<td>1. Past operating cash flows have the significant ability and positively predict future operating cash flows.</td>
</tr>
<tr>
<td></td>
<td>2. All three operating cash flows prediction models are significant in predicting future operating cash flows and generalisable to other settings.</td>
</tr>
<tr>
<td></td>
<td>3. The three years-lag operating cash flows prediction model, consisting of past one, two and three years of operating cash flows, has the strongest prediction powers.</td>
</tr>
<tr>
<td></td>
<td>4. Further evaluation on the relative contributions of individual past one, two and three years of operating cash flows predictors within all the prediction models revealed that all these operating cash flows significantly and positively predict future operating cash flows.</td>
</tr>
<tr>
<td></td>
<td>5. Incorporating more past operating cash flows in the model enhances the prediction powers of the operating cash flows models.</td>
</tr>
<tr>
<td></td>
<td>6. Focus should be on all past one, two and three years of operating cash flows when forecasting future operating cash flows.</td>
</tr>
</tbody>
</table>

Source: Summarised from regression analysis (section 4.7) and conclusion (section 5.2).
Table 5.1  Summary of the key findings and conclusions (continue)

<table>
<thead>
<tr>
<th>Hypothesis testing</th>
<th>Findings and conclusions</th>
</tr>
</thead>
</table>
| Hypothesis 3 testing: Operating cash flows combined with aggregated accruals model. | 1. Past operating cash flows combined with aggregated accruals have the significant ability to predict future operating cash flows.  
2. All three operating cash flows combined with aggregated accruals prediction models are significant in predicting future operating cash flows and generalisable to other settings.  
3. Both the one and two years-lag prediction models have the same explanatory powers and stronger than the three years-lag model.  
4. Evaluation on the relative contributions of individual past one, two and three years of operating cash flows and aggregated accruals predictors revealed that only past one year predictors positive and significantly predict future operating cash flows.  
5. The past two and three years of operating cash flows and aggregated accruals predictors have minimal relevance in predicting future operating cash flows.  
6. Focus should be mainly on past one year of operating cash flows combined with aggregated accruals when forecasting future cash flows. |
| Hypothesis 4 testing: Operating cash flows combined with disaggregated accrual components (accounts receivable changes, accounts payable changes, inventory changes, depreciation and amortization and other accruals changes) model. | 1. Past operating cash flows combined with disaggregated accrual components have the significant ability to predict future operating cash flows.  
2. All three operating cash flows combined with disaggregated accrual components prediction models are significant in predicting future operating cash flows and generalisable to other settings.  
3. The two years-lag prediction model consisting of past one and two years of operating cash flows and disaggregated accrual components has the strongest explanatory powers.  
4. Evaluation on the relative contributions of individual past one, two and three years of operating cash flows and disaggregated accrual components predictors revealed that mainly past one year predictors significantly contribute to future operating cash flows prediction. |

Source: Summarised from regression analysis (section 4.7) and conclusion (section 5.2).
### Table 5.1 Summary of the key findings and conclusions (continue)

<table>
<thead>
<tr>
<th>Hypothesis testing</th>
<th>Findings and conclusions</th>
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</table>
| Hypothesis 4 testing (con’t): Operating cash flows combined with disaggregated accrual components model. | 5. The past two and three years of operating cash flows and disaggregated accrual components have minimal relevance when forecasting future operating cash flows.  
6. Focus should be mainly on past one year of operating cash flows combined with disaggregated accrual components when forecasting future operating cash flows. |
| Hypothesis 5 testing: EBITDA model. | 1. Historical earnings before interest, tax, depreciation and amortization (EBITDA) have the significant ability to predict future operating cash flows.  
2. All three EBITDA prediction models are significant in predicting future operating cash flows and generalisable to other settings.  
3. The two years-lag EBITDA prediction model consisting of past one and two years of EBITDA has the strongest prediction powers.  
4. Further evaluation on the relative contributions of individual past one, two and three years of EBITDA revealed that only past one and two years of EBITDA predictors significantly and positively contribute to future operating cash flows prediction.  
5. The past three years-lag of EBITDA has minimal relevance when forecasting future operating cash flows.  
6. Focus should be mainly on past one and two years of EBITDA when predicting future operating cash flows. |

Source: Summarised from regression analysis (section 4.7) and conclusion (section 5.2).
### Table 5.1 Summary of the key findings and conclusions (continue)

<table>
<thead>
<tr>
<th>Hypothesis testing</th>
<th>Findings and conclusions</th>
</tr>
</thead>
</table>
| Hypothesis 6 testing: Comparing earnings, operating cash flows, accruals and EBITDA. | ![Detailed findings and conclusions](source: summarised from regression analysis (section 4.7) and conclusion (section 5.2).)

1. Earnings have superior predictive ability compared to operating cash flows.
2. EBITDA have superior predictive ability compared to both earnings and operating cash flows.
3. Past operating cash flows combined with disaggregated accrual components have the strongest predictive strength.
4. Disaggregating earnings into operating cash flows and accruals improve the predictive ability compared to aggregated earnings.
5. Disaggregating accruals into the individual components enhance further the predictive ability.
6. Accruals provide incremental explanatory powers beyond that provided by operating cash flows.
7. Disaggregated accrual components have incremental explanatory powers exceeding that contained in aggregated accruals.
8. Focus should be mainly on past one year of operating cash flows combined with disaggregated accrual components when forecasting future operating cash flows.

5.4 Implications for Theory

The implications and contributions of this study to the existing body of knowledge and theories are further discussed in this section.

Prior studies on comparing the relative abilities of earnings, operating cash flows and accruals information in predicting future operating cash flows have reported conflicting and inconclusive results. Some studies documented that earnings is superior to operating cash flows (such as Ebaid 2011; Greenberg et al. 1986; Murdoch and Kraush 1989, 1990; Pae 2005; Seng 2006), while others have reported that operating cash flows is superior to
earnings (such as Al-Attar and Hussain 2004; Barth et al. 2001; Burgstahler et al. 1998; Chotkunakitti 2005; Farshadfar, et al. 2008; Quirin et al. 1999).

Some prior studies have also disaggregated earnings into the components of operating cash flows and accruals and examined their predictive abilities with contradictory and inconclusive results. Some studies, such as Al-Attar and Hussain (2004), Barth et al. (2001) and Ebaid (2011), reported that operating cash flows combined with accruals have stronger predictive powers than both earnings and operating cash flows in predicting future operating cash flows. However, some research (Chotkunakitti 2005) documented that operating cash flows were superior to both earnings and operating cash flows combined with accruals for future operating cash flows prediction. No discernible difference on the predictive abilities between operating cash flows combined with accruals and operating cash flows were reported in other studies (Stammerjohan and Nassiripour 2001; Supriyadi 1998).

Prior studies were also mainly conducted in other countries and may not be easily generalisable within the Malaysian context due to differences in earnings volatilities, industry characteristics, statutory regimes and accounting reporting regulations, which was highlighted as a research issue in section 2.7.5. There were limited prior studies providing empirical evidence directly confirming the comparative abilities of accounting and operating cash flows information, namely earnings, accruals, EBITDA and operating cash flows, in predicting the future operating cash flows within the Malaysian context. Related prior studies within the Malaysian context mainly investigated and documented the value relevance of accounting information in explaining share market returns or in predicting financial distress.

This study has addressed the identified research issues by examining and comparing the predictive ability of accrual-based accounting and operating cash flows information for future operating cash flows. The results confirmed that earnings, accruals, EBITDA and operating cash flows have the significant ability to predict future operating cash flows within the Malaysian context, which are consistent with prior studies conducted in other
countries (such as Barth et al. 2001; Chotkunakitti 2005; Ebaid 2011; Pae 2005; Seng 2006). This study has also provided empirical evidence on the extent earnings, accruals, operating cash flows and EBITDA are able to predict the future operating cash flows of listed Malaysia industrial products manufacturing companies.

Disaggregating earnings into operating cash flows and aggregated accrual components of earnings enhances the predictive ability of earnings compared to aggregated earnings. Accruals have incremental explanatory powers beyond that contained within operating cash flows. Furthermore, operating cash flows combined with disaggregated accrual components have the most superior predictive powers in predicting future operating cash flows compared to earnings, operating cash flows, operating cash flows combine with aggregated accruals or EBITDA. This suggested that disaggregating the accruals into the individual accrual components further enhances the ability of earnings to forecast future operating cash flows. Disaggregated accrual components provided incremental explanatory powers beyond aggregated accruals. These findings are consistent with prior studies (Al-Attar and Hussain 2004; Barth et al. 2001; Ebaid 2011).

A possible explanation is that aggregated earnings comprised of operating cash flows and accruals, while aggregated accruals composed of individual accrual components. Each individual accrual component incorporates differing information content for future operating cash flows and aggregated earnings masked the contributions from these individual accrual components. Disaggregating the earnings into operating cash flows and aggregated accruals and further decomposing the aggregated accruals into the individual accrual components unmasked the contributions from each accrual component. (Barth et al. 2001; Ebaid 2011). The nature of accruals reported by Malaysian companies are also revealed as mainly short term in nature and have less persistence beyond one year of future operating cash flows.

This study also provides empirical evidence substantiating that accrual-based accounting measures are stronger than cash-based accounting measures for future cash flows prediction. The findings confirmed that the predictive ability of earnings are superior to
operating cash flows in predicting future operating cash flows within the Malaysian context. These findings are consistent to the findings from prior studies, such as Largay and Stickney (1980), Dechow, et al. (1998), Ebaid (2011), Greenberg, et al. (1986), Kim and Kross (2005), Pae (2005) and Simons (1994).

Financial analysts often emphasised EBITDA as an important accounting performance measurement and basis for forecasting future operating cash flows (Berk et al. 2009). Investors prefer EBITDA, which exclude depreciation and amortization in the computation, compared to net earnings (Misund et al. 2005). Prior research have mainly examined and documented the value relevance of EBITDA in explaining share market returns (Florou and Chalevas 2010; Misund et al. 2005) but there was limited empirical evidence on the predictive ability of EBITDA for future operating cash flows. This research contributes to extant literature by providing empirical evidence confirming that EBITDA are significantly positive in predicting at least up to two years- ahead operating cash flows. This research also confirms that the EBITDA are relatively stronger to both earnings and operating cash flows for future operating cash flows prediction. A possible explanation for the superiority of EBITDA is because it includes more relevant components relating to future operating cash flows compared to earnings and operating cash flows. EBITDA exclude depreciation and amortization, which are non-cash expenses that do not translate to operating cash flows in the future but includes accruals, which reflect deferred cash receipts and payments to the future periods. In contrast, earnings incorporate depreciation and amortization expenses, which is subject to management estimation discretions (Ayers et al. 2006) and do not translate to future operating cash flows, while operating cash flows ignore accrual components that impact future operating cash flows. This study confirms the usefulness of EBITDA as being more useful and relevant compared to earnings and operating cash flows in forecasting future operating cash flows.

This study addressed the research issues identified from reviewing current literature by extending prior studies, which were mainly conducted in other countries, in the Malaysian context. It provides empirical evidence on the extent to which earnings,
operating cash flows, accruals and EBITDA accounting information are able to predict future operating cash flows within the Malaysian context.

5.5 Implications for Policy and Practice

This section examines the practical implications of the findings from this study to accounting policies and practices.

**Accrual accounting convention is superior to cash accounting convention**

Accruals-based accounting is the recommended generally accepted accounting convention in the preparation of financial statements (FASB 1978; IASB 2001). Information prepared under the accrual accounting convention are asserted by accounting standard setters as superior to cash flows information prepared under the cash accounting convention in predicting future operating cash flows (FASB 1978). Reporting under the cash accounting convention may result in timing and matching issues due to mismatches in cash receipts and cash payment transactions. The accrual accounting process is expected to enhance the variability of operating cash flows information. This is expected to make the information more relevant to users for decision-making purposes.

Studies conducted in Malaysia have mainly examined and documented the value relevance of accounting information in explaining equity market returns (such as Cheng and Mohamad 2008; Kadri et al. 2010; Shukor et al. 2009) or in predicting financial distress (such as Abdullah et al. 2001; Muhamad-Sori et al. 2006; Muhamad-Sori et al. 2001). However, there are limited studies providing direct empirical evidence on the predictive powers of accrual-based accounting and operating cash flows information for future operating cash flows prediction and in comparison with each other within the Malaysian context, especially for the important industrial products manufacturing industry. This study provides direct empirical evidence confirming and reinforcing accrual accounting principles as the recommended accounting convention when preparing financial statements. Earnings and EBITDA, which are both prepared under the accrual accounting convention, are confirmed as superior to operating cash flows, which is prepared under cash accounting convention, in predicting future operating cash flows.
within the Malaysian context. The findings are consistent with prior literature, which are conducted in other countries (such as Dechow et al. 1998; Ebaid 2011; Kim and Kross 2005; Pae 2005). The findings are also similar to related prior capital market studies within the Malaysian context that accrual-based earnings information are more useful than operating cash flows information in explaining stock market returns (Cheng and Mohamad 2008).

This study also confirms that the reported financial information prepared in accordance to MASB issued accounting standards are relevant for forecasting future operating cash flows. This provides empirical evidence substantiating the usefulness of accounting information disclosed for forecasting future operating cash flows since the accounting regulatory and corporate governance reforms introduced after the Asian financial crisis in 1997/1998.

The findings also confirmed that accruals provide incremental explanatory powers beyond that provided by operating cash flows. When accruals are combined with operating cash flows, the predictive powers of the resultant model is found to be stronger than the earnings or operating cash flows as a single predictor of future operating cash flows. Disaggregated accrual components were also revealed to have incremental explanatory powers exceeding that within aggregated accruals. These findings refute the perception by financial analysts in Malaysia that cash flows information are superior to accrual-based income statement information, such as earnings, when forecasting future cash flows. Financial analysts should emphasise more on earnings and accruals information than operating cash flows when forecasting future operating cash flows.

**Findings useful in guiding future operating cash flows prediction**

This study examined and documented the extent to which past accrual-based and cash-based accounting measures are able to predict future operating cash flows within the Malaysian context. This study provides insights on the comparative relevance of reported financial information for estimating future operating cash flows within the Malaysian context.
The findings from this research are useful in guiding users of reported financial statements, such as financial analysts, creditors and investors, on which aspects of the reported financial information should be emphasised when estimating operating cash flow forecasts. This should enhance the accuracy of the operating cash flow forecasts and share value estimates, leading to more informed economic decision making. The validated prediction models developed by this study are also applicable and can be used to predict the future operating cash flows for several years.

EBITDA is confirmed by this study to have stronger predictive powers than earnings and operating cash flows information for future operating cash flows. This is an important accounting measurement emphasized by investors, incorporated in the research reports prepared by financial analysts in Malaysia and often used as a basis to forecast the operating cash flows of the company. Nevertheless, it is not currently mandated by the accounting standards to explicitly report in the financial reports. Some companies voluntarily disclose this information to provide more relevant information to financial statement users, but this practice is not standardized throughout. Although EBITDA can be derived from the information disclosed in the notes accompanying the published annual financial statements, the accounting standard setters or other governing authorities (such as Bursa Malaysia or Securities Commission Malaysia) may consider imposing this as a mandatory accounting measure to be explicitly reported by Malaysian companies in the annual financial statements. This will standardize reporting throughout Malaysian companies and ease performance comparison.

**Empirical evidence directly substantiating FRS 107 accounting standard**
The Malaysian accounting standard, FRS107, requires and governs the preparation of the operating cash flows statement. FRS 107 emphasises that the historical operating cash flows information disclosed in this statement are important in forecasting future operating cash flows when used with other information (MASB 2010, paragraph 13). FRS 107 has also recommended that past operating cash flows information is an important source of information as an indicator of “the amount, timing and certainty of future cash flows” (MASB 2010, paragraph 5).
This study provides empirical evidence confirming that past operating cash flows have the significant ability to predict the future operating cash flows of listed Malaysian industrial products manufacturing companies. Past three years of operating cash flows information are confirmed relevant and useful for future operating cash flows prediction.

This study has also revealed that the predictive powers of past operating cash flows are enhanced when combined and used jointly with accruals, such that the combined model is superior to both the earnings and operating cash flows as a single predictor of future operating cash flows. These findings confirm the claims by accounting standard FRS107 (MASB 2010, paragraph 13) that the operating cash flows information disclosed in the operating cash flows statement provides an important source of supplementary information, such as when used jointly with accruals, for forecasting future operating cash flows.

5.6 Limitations
The previous sections examined the conclusions and implications of this study. This section discusses on the limitations of this study.

The scope of this study was restricted to listed companies within the Malaysian industrial products manufacturing industry. The findings are specific to this industry and may not be generalisable to other industries nor unlisted Malaysian companies in this industry.

Companies that do not have 31st December year-end, suspended from listing due to restructuring (PN17 companies) or changed financial year-end during the period of study are excluded from the sample. The findings from this study may not be applicable to such companies.

This prediction study assumed that the historical data used is generalisable to future periods. The prediction models were cross validated and concluded to be adequately robust to predict the future operating cash flows of listed Malaysian industrial products manufacturing companies for several years. However, this study assumed that the
business environment in the future remains fairly stable and similar with the past. If the business environment in the future periods changes substantially, then findings from this study are not generalisable to these future periods.

5.7 Implications for Future Research
The previous section described the limitations of this study. This section examines the potential areas for future research. Since this study is restricted to listed companies within the industrial products manufacturing industry in Malaysia, future research can replicate the methodologies in this study and extend to other industries or unlisted companies within this industry in Malaysia. Future research can also extend this study by examining companies that do not have 31st December year-end as this study only selected firms with 31st December year-end. Furthermore, future studies can also examine and compare the relative predictive abilities of disaggregated operating cash flows components (such as operating cash flows from customers, suppliers, dividends and interest paid/received), investing or financing operating cash flows within the Malaysian context.

5.8 Summary
This last chapter described the conclusions and implications from the findings in the context of relevant literature and discussed on the practical and policy implications from this study. The research problem and research questions, as described in section 2.8 were answered and the research objectives, as described in section 3.4.2, were achieved.

This study extended previous studies, which were conducted in other countries, to the Malaysian context and provided direct empirical evidence that earnings, operating cash flows, accruals and EBITDA are relevant in predicting future operating cash flows within the Malaysian context. The model comprising of operating cash flows combined with disaggregated accrual components were documented to have the strongest predictive ability for future operating cash flows. The findings indicated that disaggregating earnings into the operating cash flows and accrual components of earnings enhance the predictive ability compared to aggregated earnings. Accruals have incremental information content beyond that present in operating cash flows. Decomposing the
aggregated accruals into the individual accrual components were also revealed to enhance further the predictive ability for future operating cash flows. Disaggregated accrual components provide incremental information content exceeding that provided by aggregated accruals. Accruals reported by listed Malaysian industrial products manufacturing companies are also revealed to be mainly short term in nature and less persistent beyond one year of future operating cash flows.

The findings confirmed that accounting information prepared under accrual accounting convention is more useful than information prepared under cash accounting convention for future operating cash flows prediction. Earnings and EBITDA are revealed as superior to operating cash flows in predicting future operating cash flows. EBITDA are also confirmed superior to both earnings and operating cash flows for future operating cash flows prediction. Consequently, EBITDA are revealed as a more useful alternative performance indicator in assessing the ability of companies to generate future operating cash flows compared to earnings and operating cash flows. This study also confirms that operating cash flows information does play an important supplementary role and useful for forecasting future operating cash flows, especially when used in conjunction with disaggregated accrual components.

This study has also revealed that as individual predictors, earnings and accruals are significantly able to predict only one year-ahead future operating cash flows, EBITDA can significantly predict up to two years-ahead while operating cash flows can significantly predict up to three years-ahead.

Finally, there were limited studies conducted in this area within the Malaysian context and this study narrowed the identified gaps in current literature. This research contributes to the body of knowledge empirical evidence on the comparative abilities of accrual-based versus cash-based accounting measures for future operating cash flows prediction within the Malaysian industrial products manufacturing industry context. However, there are some limitations to this research, which future research can extend this study and address such limitations.
REFERENCES


----1997a, 'The value-relevance of SFAS No. 95 cash flows from operations as assessed by security market effects', *Accounting Horizons*, vol. 11, no. 3, pp. 1-15.

----1997b, 'Accounting accruals and the incremental information content of earnings and cash flows from operations', *Advances in Accounting*, vol. 15, December, pp. 101-124.


Kim, M. and Kross, W. 2005, ‘The ability of earnings to predict future operating cash flows has been increasing – not decreasing’, *Journal of Accounting Research*, vol.43, no.5, pp.753-780.


MASB 2007, Framework for the preparation and presentation of financial statements, Malaysian Accounting Standards Board (MASB), Kuala Lumpur.


McMurray, D. 2008, Study Guide: EDU03262 Qualitative Research Methods, Southern Cross University, Lismore.


APPENDIX A

Histograms of current year, one year lagged, two years lagged and three years lagged variables

Source: Developed from sample data.

Source: Developed from sample data.
APPENDIX A

Histograms of current year, one year lagged, two years lagged and three years lagged variables (continue)

Source: Developed from sample data.

Source: Developed from sample data.
APPENDIX A

Histograms of current year, one year lagged, two years lagged and three years lagged variables (continue)

Source: Developed from sample data.

Source: Developed from sample data.
APPENDIX A

Histograms of current year, one year lagged, two years lagged and three years lagged variables (continue)

Source: Developed from sample data.

Source: Developed from sample data.
APPENDIX A

Histograms of current year, one year lagged, two years lagged and three years lagged variables (continue)

Source: Developed from sample data.

Source: Developed from sample data.
APPENDIX A

Histograms of current year, one year lagged, two years lagged and three years lagged variables (continue)

Source: Developed from sample data.

Source: Developed from sample data.
APPENDIX A

Histograms of current year, one year lagged, two years lagged and three years lagged variables (continue)

Source: Developed from sample data.

Source: Developed from sample data.
APPENDIX A

Histograms of current year, one year lagged, two years lagged and three years lagged variables (continue)

TWO YEARS LAGGED DEPRECIATION

THREE YEARS LAGGED DEPRECIATION

Source: Developed from sample data.
APPENDIX A

Histograms of current year, one year lagged, two years lagged and three years lagged variables (continue)

Source: Developed from sample data.

Source: Developed from sample data.
APPENDIX A

Histograms of current year, one year lagged, two years lagged and three years lagged variables (continue)

![THREE YEARS LAGGED INVENTORY](image)

Source: Developed from sample data.

![CURRENT YEAR ACCOUNTS RECEIVABLE](image)

Source: Developed from sample data.
APPENDIX A

Histograms of current year, one year lagged, two years lagged and three years lagged variables (continue)

ONE YEAR LAGGED ACCOUNTS RECEIVABLE

Source: Developed from sample data.

TWO YEARS LAGGED ACCOUNTS RECEIVABLE

Source: Developed from sample data.
APPENDIX A

Histograms of current year, one year lagged, two years lagged and three years lagged variables (continue)

THREE YEARS LAGGED ACCOUNTS RECEIVABLE

Source: Developed from sample data.

CURRENT YEAR ACCOUNTS PAYABLE

Source: Developed from sample data.
APPENDIX A

Histograms of current year, one year lagged, two years lagged and three years lagged variables (continue)

ONE YEAR LAGGED ACCOUNTS PAYABLE

Source: Developed from sample data.

TWO YEARS LAGGED ACCOUNTS PAYABLE

Source: Developed from sample data.
APPENDIX A

Histograms of current year, one year lagged, two years lagged and three years lagged variables (continue)

THREE YEARS LAGGED ACCOUNTS PAYABLE

Source: Developed from sample data.

CURRENT YEAR OTHER ACCRUALS

Source: Developed from sample data.
APPENDIX A

Histograms of current year, one year lagged, two years lagged and three years lagged variables (continue)

Source: Developed from sample data.

Source: Developed from sample data.
APPENDIX A

Histograms of current year, one year lagged, two years lagged and three years lagged variables (continue)

Source: Developed from sample data.

Source: Developed from sample data.
APPENDIX A

Histograms of current year, one year lagged, two years lagged and three years lagged variables (continue)

Source: Developed from sample data.

Source: Developed from sample data.
APPENDIX A

Histograms of current year, one year lagged, two years lagged and three years lagged variables (continue)

Source: Developed from sample data.
### APPENDIX B

**Skewness and Kurtosis statistical results to test normality of each variable**

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>Skewness Statistic</th>
<th>Skewness Std. Error</th>
<th>Kurtosis Statistic</th>
<th>Kurtosis Std. Error</th>
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<th>Kurtosis*</th>
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**Source:** Developed from sample data using SPSS

* Skewness and Kurtosis divided by Standard Error is less than absolute value of 3.29 for all variables.
APPENDIX C

Histogram of residuals from each regression model

ONE YEAR LAGGED EARNINGS MODEL RESIDUALS

Source: SPSS regression results.

TWO YEARS LAGGED EARNINGS MODEL RESIDUALS

Source: SPSS regression results.
APPENDIX C

Histogram of residuals from each regression model (continue)

THREE YEARS LAGGED EARNINGS MODEL RESIDUALS

Source: SPSS regression results.

ONE YEAR LAGGED OPERATING CASH FLOWS MODEL RESIDUALS

Source: SPSS regression results.
APPENDIX C

Histogram of residuals from each regression model (continue)

TWO YEARS LAGGED OPERATING CASH FLOWS MODEL RESIDUALS

Source: SPSS regression results.

THREE YEARS LAGGED OPERATING CASH FLOWS MODEL RESIDUALS

Source: SPSS regression results.
APPENDIX C

Histogram of residuals from each regression model (continue)

Source: SPSS regression results.

Source: SPSS regression results.
APPENDIX C

Histogram of residuals from each regression model (continue)

 THREE YEARS LAGGED OPERATING CASH FLOWS COMBINED WITH AGGREGATED ACCRUALS MODEL RESIDUALS

Source: SPSS regression results.

 ONE YEAR LAGGED OPERATING CASH FLOWS COMBINED WITH DISAGGREGATED ACCRUAL COMPONENTS MODEL RESIDUALS

Source: SPSS regression results.
APPENDIX C

Histogram of residuals from each regression model (continue)

Source: SPSS regression results.

Source: SPSS regression results.
APPENDIX C

Histogram of residuals from each regression model (continue)

Source: SPSS regression results.
APPENDIX C

Histogram of residuals from each regression model (continue)

Source: SPSS regression results.
APPENDIX D

Scatter-plot graph of standardized residuals plotted against standardized predicted values for each model (continue)

Source: SPSS regression results.

Source: SPSS regression results.
APPENDIX D

Scatter-plot graph of standardized residuals plotted against standardized predicted values for each model (continue)

THREE YEARS LAGGED EARNINGS MODEL RESIDUALS

Source: SPSS regression results.

ONE YEAR LAGGED OPERATING CASH FLOWS MODEL RESIDUALS

Source: SPSS regression results.
APPENDIX D

Scatter-plot graph of standardized residuals plotted against standardized predicted values for each model (continue)

Source: SPSS regression results.

THREE YEARS LAGGED OPERATING CASH FLOWS MODEL RESIDUALS

Source: SPSS regression results.
APPENDIX D

Scatter-plot graph of standardized residuals plotted against standardized predicted values for each model (continue)

Source: SPSS regression results.

Source: SPSS regression results.
APPENDIX D

Scatter-plot graph of standardized residuals plotted against standardized predicted values for each model (continue)

Source: SPSS regression results.

Source: SPSS regression results.
APPENDIX D

Scatter-plot graph of standardized residuals plotted against standardized predicted values for each model (continue)

Source: SPSS regression results.

Source: SPSS regression results.
APPENDIX D

Scatter-plot graph of standardized residuals plotted against standardized predicted values for each model (continue)

Source: SPSS regression results.

Source: SPSS regression results.
APPENDIX D

Scatter-plot graph of standardized residuals plotted against standardized predicted values for each model (continue)

THREE YEARS LAGGED EBITDA MODEL RESIDUALS

Source: SPSS regression results.