CHAPTER 4

RESEARCH METHODOLOGY

4.1 Introduction

The main objective of this chapter is to provide insight into how this study was developed and to describe in detail the sample, data, variables, and empirical models used to examine and discriminate the performance of ASE Index companies. The chapter firstly begins with the ontological, epistemological, and philosophical stances, as well as the research approach, of this study. Secondly, it clarifies in detail the methodology, sample, data, variables and their measurements, and empirical models. Finally, it describes the analysis techniques.

4.2 Ontology

Empirical realists presuppose their ontology implicitly by deriving it from their epistemology, but critical realists and idealists explicitly declare their ontology. Ontology is essential for social theory and sociology for two reasons. First, it inherently exists in any person, as it relates to beliefs about the nature of the world. Second, it influences the chains of meta-theoretical concepts. That is, a researcher's ontology influences his epistemology, methodology and methods, objectives, and theoretical framework (Fleetwood, 2014). However, as Knight (2002, p. 33) argued, there is no definite association between ontology and other components of research paradigm, so certain epistemological frameworks or research methods, for example, are not restricted or bonded to certain ontologies. The ontology, however, should justify the selection of those meta-theoretical concepts and methodologies.

The researcher's ontological position is based on the Islamic worldview, that mankind is God's successor on earth. Nonetheless, the present study's ontological position rests on objectivism, which assumes certain parts of the world to be observable phenomena that are amenable to scientific inquiry. The phenomena are assumed to be fused with the events that underlie and create the observations. Accordingly, this view renders the observation of events as the sole reliable path to knowledge (Fleetwood, 2014).

4.3 Epistemology

'Epistemology' is derived from the Greek word *episteme*, which means knowledge. It converges the knowledge-gathering process and contributes to theory and model development (Grix, 2004, p. 60). Gall, Gall, & Borg (2003, p. 13) defined epistemology as "a branch of philosophy that studies the nature of knowledge and the process by which knowledge is acquired and validated". The epistemological question, according to Patton (2002), leads a researcher to debate "the possibility and desirability of objectivity, subjectivity, causality, validity, and generalisability".

The Quran has mentioned Islamic epistemology based on Islamic ontology. The following verse of al-Baqarah (2:260) reveals the importance of knowledge:

{ وَإِذْ قَالَ إِبْرَاهِيمُ رَبِّ أَرِنِي كَيْفَ تُحْيِي الْمَوْتَىٰ ۖ قَالَ أَوَلَمْ تُؤْمِن ۖ قَالَ بَلَىٰ وَلَٰكِن لِّيَطْمَئِنَّ قَلْبِي ۖ قَالَ فَخُذْ أَرْبَعَةً مِّنَ الطَّيْرِ فَصُرْهُنَّ إِلَيْكَ ثُمَّ اجْعَلْ عَلَىٰ كُلِّ جَبَلٍ مِّنْهُنَّ جُزْءًا ثُمَّ ادْعُهُنَّ يَأْتِينَكَ سَعْيًا ۚ وَاعْلَمْ أَنَّ اللَّهَ عَزِيزٌ حَكِيمٌ }

{And when Ibrahim said, "My Lord, show me how you give life to the dead." Allah said, "Have you not believed?" He said, "Yes, but I ask only that my heart may be satisfied." Allah said, "Take four birds and commit them to yourself, after slaughtering them, put on each hill a portion of them; then call them – they will come flying to you in haste, and know that Allah is exalted in Might and Wise"}.

The epistemological stance of this study is post-positivism, which argues that by combining empirical observations with logical reasoning, a researcher can make reasonable inferences about a phenomenon. Additionally, it holds the view that science is probabilistic, not deterministic (Bhattacherjee, 2012).

4.4 Researcher's Philosophical Stance

The ontological position of the present study is objectivism, while its epistemological stance is post-positivism, which emphasises the importance of understanding the reality of a certain phenomenon and views science as probabilistic: it is based on many contingencies that must continually be explored so that social reality can be understood better. The current study employs knowledge to discover the truth of certain phenomena occurring in this world. To reach this truth, the researcher needs to hold certain reasonable assumptions about the phenomena.

Many researchers have integrated Islamic view into the philosophical worldview, but is the verification of phenomena occurring in this world far from the Islamic view? The answer is that Islamic worldview encompasses the importance of knowledge. In fact, the Muslim researcher is absolutely certain that the study of any phenomena is the sanctification of the One Creator (God). He also holds the implicit intention, emerging from his belief, that everything he does in this world is purely for the sake of God. In addition, al-Quran al-Kareem in al-Isra (17:44) emphasises that all phenomena occurring in the earth and the heavens sanctify God alone, but the human mind is unable to comprehend this:

{ تُسَبِّحُ لَهُ السَّمَاوَاتُ السَّبْعُ وَالْأَرْضُ وَمَن فِيهِنَّ ۚ وَإِن مِّن شَيْءٍ إِلَّا يُسَبِّحُ بِحَمْدِهِ وَلَٰكِن لَّا تَفْقَهُونَ تَسْبِيحَهُمْ ۗ إِنَّهُ كَانَ حَلِيمًا غَفُورًا }

{The seven heavens and the earth, and whoever is therein, glorify Him. There is nothing that does not glorify Him with His praise (proclaiming that He alone is God, without peer or partner, and all praise belongs to Him exclusively), but you cannot comprehend their glorification. Surely, He is clement, All-Forgiving}.

Though the current study is based on objectivist ontology and post-positivist epistemology, this work is for the sake of God. This is the implicit intention in my faith and belief as a Muslim researcher.

4.5 Research Approach

Researchers may use three types of research approach: 1) deduction in quantitative research, 2) induction in qualitative studies, and 3) abduction in pragmatic research. Table 4.1 highlights the major differences between them in terms of theory, use of data, and generalisability (Saunders, Lewis, & Thornhill, 2009, p. 124).

Table 4.1: Differences between Research Approaches

Approach / **Term**	**Deduction**	**Induction**	**Abduction**
Theory	Falsification, verification	Generation, building	Generation, incorporating, modifying, building
Use of data	Evaluate hypotheses related to an existing theory	Explore a phenomenon, identify themes and patterns, and create a conceptual framework	Explore a phenomenon, identify themes and patterns, create a conceptual framework, and test through subsequent data
Generalisability	From general to specific	From specific to general	Interactions between the specific and the general

Source: Saunders, Lewis, & Thornhill (2009, p. 124)

The current study intends to verify theories and test certain hypotheses formulated based on those theories. As these were accomplished using quantitative data and

methods on a sample that can adequately represent the population, the findings are expected to be generalisable. In this case, the study followed the deductive approach, as shown in Figure 4.1.

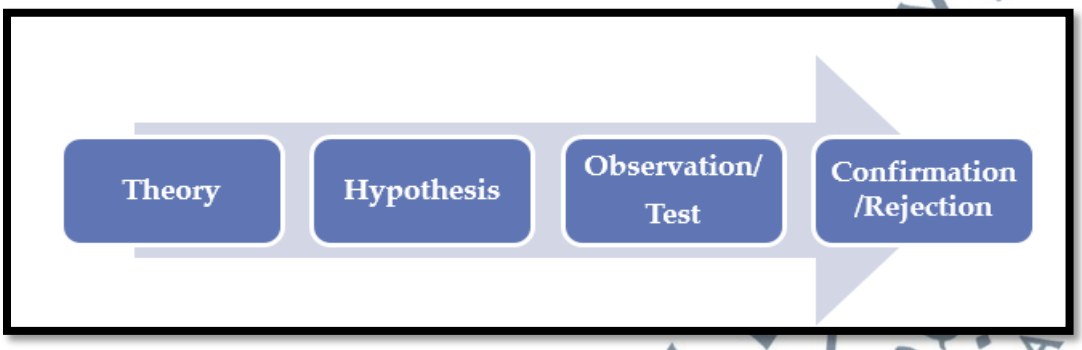

Figure 4.1: Deductive Research Approach

4.6 Methodology

Methodology is a strategy, plan of work, and design or process that informs the researcher's choice of research methods based on a critical analysis of the data production techniques (Crotty, 1998, p. 3). Grix (2004, p. 32) stated that it refers to the "discussion of how a particular piece of research should be undertaken". Methodology is the rules that guide the researcher on how he should be studying the world (Rehman & Alharthi, 2016). The methods used to collect and analyse data are discussed in the following subsections.

4.6.1 Sources of Data

The study mainly used secondary data sources of Amman Stock Exchange (ASE), Central Bank of Jordan (CBJ), and scientific publications. Table 4.2 summarizes the names of data used, as well as their types and sources.

Table 4.2: Sources of Data

Data Name	**Type of Data**	**Sources of Data**
Annual Reports of Companies	Financial Statements	Historical Data of ASE
Trading Reports of Companies	Prices of Stocks	Historical Data of ASE
Financial Statistics Reports	Risk-Free Rate	Historical Data of CBJ
Economics Statistics Reports	Economics Reports	World Bank Report
Printed and Digital Articles	Previous Studies	Journals Publications
Textbooks	Financial Theories	Books Publications

The monthly and annual data of the sample were gathered primarily from annual reports and the ASE database. To ensure the validity of findings and soundness of analysis, it is necessary that there are no missing data. For this reason, 37 companies were removed from the original sample of 100 firms, leaving a final sample of 63 companies.

4.6.2 Sampling

Data collected from individuals, events, or objects are essential to solve the research problem. Researchers are interested in selecting the right individuals, objects, or events that represent a specific population. Sampling is the process of selecting a sufficient element of the population to understand its characteristics and generalise the results to the entire population. Descriptive statistics, such as population mean (μ), standard deviation (σ), and variance (σ^2), are typically used to estimate population characteristics based on the sample (Sekaran, 2003, p. 266). The difference in sampling method may lead to difference in the study population estimation.

Population refers to the entire group of people, events, or objects that the researcher wishes to investigate. A single member of the population is an element. Researchers can obtain more reliable data by obtaining a sample of the population. Sample refers to the subset of the population and comprises some members selected from it (Sekaran, 2003). Sampling is done to reduce time, cost, and effort. In some cases, it is impossible to use all elements of the population to gain knowledge on or investigate a phenomenon. Usually, researchers select a sample to draw conclusions and generalise them to the population. A single member of the sample represents a subject.

To answer the research questions, the sample should consist of subjects who are in the best position to provide the required information. It is also necessary to obtain information from specific target groups, as they could provide more dependable information that can be generalized to the population. Therefore, the current study uses the non-probability purposive sampling. In addition, as discussed in the problem statement, the companies' performance started to decline 2008. The Middle East, especially Jordan, have suffered from numerous economic and political crises (e.g., Palestinian crisis, Arab Spring, and Syrian refugee crisis) since 2008, the start of the

sample period. These crises have caused unwillingness to invest, leading to declining trade volume. It is therefore appropriate to choose this year as the start of the sample period. The companies were discriminated into performing and underperforming using 2018 accounting and market indicators, as they are the most recent dataset available.

The population of this study was all companies listed on the Amman Stock Exchange from 1 January 2008 to 31 December 2018. The final sample comprised 63 companies that constitute the stock market's general index, that is, the ASE Index, as at 1 January 2019. The ASE Index only constitutes companies with large trading volumes. The researcher chose those companies as they reasonably represent the overall market. The companies' sample categories are detailed in Appendix 2.

4.6.3 Study Variables

Anything that can take on varying values is called a variable. A variable may have different values across times, and different variables may have different values at the same time (Sekaran, 2003, p. 87). The current study employed three types of variables: dependent, independent variables, and mediating.

In the current study, the asset pricing theory founding the three main dependent variables of company performance (price, return and the Jensen's alpha performance model) and mediator variable (stock volatility). The independent variables are founded by the financial statement analysis techniques, which explains a wide range of variables. The nature of the study sample requires choosing a set of variables that are available to all investors in each company. Therefore, all independent variables common to the companies were selected. On the other hand, based on the development of explanatory variables, control variables were excluded from this study. The following subsection presents the definition of the selected variables and their measurements.

4.6.3.1 Dependent Variable

The variable of primary importance to the researcher is the dependent variable. It is the researcher's goal to understand it, explain its variability, and predict it. The investigation of a dependent variable allows the researcher to find solutions to the research problem (Sekaran, 2003, p. 88). The dependent variable in this study is company (or companies') performance. The study used measures of firms' operational activity performance (e.g., profitability indicators, liquidity, valuation, and market capitalization) to explain the firms' performance in the market. Therefore, the current study employed the firms' stock prices and returns to measure firm performance. It should be noted that the study used both price and return to measure firm performance. In Jordan, previous studies showed that the regression of price model differs from the return model. Each model may suit the different interests of market users. Thus, to accomplish the research objectives, the final measures were computed using the following formulas (Strong, 2008, p.30; Shams & Rezvani, 2015; Allozi & Obeidat, 2016; Narayan & Reddy, 2018; Susilawati & Suryaningsih, 2020):

$$P_{i,t} \qquad (4.1)$$

where $P_{i,t}$ is the annual stock price of company i in period t.

$$R_{i,t} = (P_{i,t} - P_{i,t-1}) / P_{i,t-1} \qquad (4.2)$$

where $P_{i,t}$ is the annual stock price of company i in period t and P_{it-1} is the annual stock price of company i in period t-1.

$$R_{i,t} = (P_{i,t} - P_{i,t-1}) / P_{i,t-1} \qquad (4.3)$$

where $P_{i,t}$ is the monthly stock price of company i in period t and P_{it-1} is the monthly stock price of company i in period t-$_1$. The company performance will be computed using the Jensen's alpha model ($R_i = \alpha + \beta R_m$). Thus, market return will be regressed to stock return to obtain α and β. The risk-free rate R_f is based on the yield of the JGB.

4.6.3.2 Independent Variables

The independent variable is one that positively or negatively influences the dependent variable. Each unit increase in the dependent variable leads to a unit increase or decrease in the dependent variable. In other words, the independent variable accounts for the variance in the dependent variable. It is not a straightforward causal relationship, the establishment of which requires specific methods or approaches (Sekaran, 2003, p. 89; Saunders, Lewis, & Thornhill, 2009, p. 356).

Accounting and market indicators were used as independent variables to measure the performance of the sample. The chosen indicators reflect the firms' operational activities performance and market performance. They are also supported by the three identified main dimensions (i.e., firm characteristics, financial analysis, and Z-score (MDA)). To illustrate, profitability indicators indicate the ability of companies to generate profit from their business activities using all available resources (i.e., ROA, ROE, NPM, and TOA). Credit risk indicators relate to liquidity, capital structure, and solvency (i.e., CR and DR). Liquidity and solvency indicators indicate the ability of a company to meet obligations (i.e., EPS and STR). Valuation indicators estimate the intrinsic value of company stock (i.e., MC, BPS, PER, PBV). The sample of the study comprised constituents of the ASE General Index, which means that the sample operate in different sectors with distinct activities. Therefore, all accounting and market indicators available in every company were selected. Furthermore, the measurements of indicators were adopted to reflect the employed explanatory variables so as to accomplish the study objectives based on previous studies. The accounting and market indicators measured the annual data of each company. Table 4.3 displays the indicators assigned as the independent variables, as well as their categories and measurements. The categorisation was based on the surveyed literature.

Table 4.3: List of Independent Variables

#	Variables	Category	Measurement	Reference
1	Return on Asset (ROA)	Accounting	Net Profit / Average Asset	(Allozi & Obeidat, 2016; Almomani, 2016; Narayan & Reddy, 2018)
2	Return on Equity (ROE)	Accounting	Net Income / Average Shareholders' Equity	(Brealry et al. 2011, p. 712; Allozi & Obeidat, 2016; Narayan & Reddy, 2018; Susilawati & Suryaningsih, 2020)
3	Net Profit Margin (NPM)	Accounting	Net Income / Total Income	(Whitehurst, 2003, p. 102; Allozi & Obeidat, 2016)
4	Current Ratio (CR)	Accounting	Current Asset / Current Liabilities	(Gibson, 2009, p. 221; Allozi & Obeidat, 2016)
5	Debt Ratio (DR)	Accounting	Total Liabilities / Shareholders Equity	(Robinson et al., 2009, p. 289; Allozi & Obeidat, 2016; Susilawati & Suryaningsih, 2020)
6	Total Assets Turnover (TOA)	Accounting	Total Revenue / Average Asset	(Subramanyam & Wild, 2009, p. 37; Gibson, 2009, p. 221; Allozi & Obeidat, 2016)
7	Market Capitalisation (MC)	Market	Price Per Share * Number of Shares Outstanding	(O'Regan, 2002; Olson, 2005; Koller et al., 2010)
8	Stock Turnover Ratio (STR)	Market	Shares Traded / Number of Shares Outstanding	(Brealry et al. 2011, p. 712; Al-oshaibat & Al-manaseer, 2018)
9	Earnings Per Share (EPS)	Market	Net income / Average Common Shares	(Horobet, 2012; Allozi & Obeidat, 2016; Susilawati & Suryaningsih, 2020)
10	Book Value Per Share (BPS)	Market	Reported Book Value	(Gibson, 2009, p. 222; Al-oshaibat & Al-manaseer, 2018)
11	Price Earnings Ratio (PER)	Market	Share Market Price / Earnings Per Share	(Subramanyam & Wild, 2009, p. 37; Al-oshaibat & Al-manaseer, 2018)
12	Price-to-book Value (PBV)	Market	Share Market Price / Book Value Per Share	(Subramanyam & Wild 2009, p. 37; Gibson, 2009, p. 222;)

4.6.3.3 Mediator Variable

The mediator variable is one that has a mediating effect on the relationship between the independent variable and the dependent variable (Sekaran, 2003, p. 91). The study used stock volatility as the mediator variable, which was expected to influence the relationships between the accounting and market indicators and company performance. Analysing the mediating effect of stock volatility contributes additional knowledge regarding the measurement of company performance.

Recently, researchers have placed great attention on volatility measurement. There are many measures of volatility (e.g. variance, standard deviation, and etc.). Poon & Granger (2003) reviewed 93 studies to determine the best method to forecast volatility. They concluded that GARCH produces the most accurate forecast of volatility. Therefore, the current research employed the GARCH model to measure the stock volatility of Amman Stock Exchange Index companies using monthly data of stock prices P_i and stock returns R_i for each company. The GARCH model is generally expressed as (Bollerslev, 1986):

$$\boldsymbol{\sigma t^2 = \omega + \sum_{j=1}^{q} \alpha j\, \varepsilon^2 t - J + \sum_{i=1}^{p} \beta i \sigma^2 t - J} \qquad \textbf{(4.4)}$$

where i =0, 1, 2, 3; P is conditional volatility; ω, α_j, β_i are non-negative constants, with $\alpha_j + \beta i < 1$ should be close to unity for an accurate estimation; ε_{t-j} is residuals and lagged conditional volatility. The last part of the formula is the main difference between ARCH and GARCH models. α_j and ε^2_{t-J} are ARCH components ($\sigma^2 = \alpha 0 + \sum_{i=1}^{q} \alpha i\, \varepsilon^2 t - i$), while β_i and σ^2_{t-J} are GARCH components (Al-Najjar, 2016; Engle, 1982).

4.6.4 Empirical Models

Three models were developed to accomplish the research objectives, that is, the effects of accounting and market indicators on company performance.

Model (1): Regression of companies' performance (price P_i and return R_i) on the independent variables:

$$CP_{it} = \beta_0 + \beta_{i1}ROA_t + \beta_{i2}ROE_t + \beta_{i3}NPM_t + \beta_{i4}CR_t + \beta_{i5}DR_t + \beta_{i6}TOA_t + \beta_{i7}MC_t + \beta_{i8}STR_t + \beta_{i9}EPS_t + \beta_{i10}BPS_t + \beta_{i11}PER_t + \beta_{i12}PBV_t + \varepsilon_t$$

where CP_{it} is performance of company i (price Pi and return Ri) at time t; β_0 is constant; β_i is regression coefficients; *ROA* is return on assets; *ROE* is return on equity; *NPM* is net profit margin; *CR* is current ratio; *DR* is debt ratio; *TOA* is total assets turnover; *MC* is market capitalisation; *STR* is stock turnover ratio; *EPS* is earnings per share; *BPS* is book value per share; *PER* is price earnings ratio; *PBV* is price-to-book value; ε_t is residuals.

Model (2): Multiple discriminant analysis of the dependent variable using the independent variables:

$$Z_{jk} = \alpha + W_1X_{1k} + W_2X_{2k} + W_3X_{3k} + ... + W_nX_{nk}$$

where Z_{jk} is discriminant Z-score function; α is intercept; W_i is discriminant weight for independent variable i; X_{ik} is independent variable i for object k.

Model (3): The mediating effect of stock volatility (price volatility PV_i and return volatility RV_i) on the relationship between the independent variables and companies' performance (price P_i and return R_i):

$$V_{it} = \beta_0 + \beta_1IV_{it} + \varepsilon_{it}$$

$$CP_{it} = \beta_0 + \beta_1IV_{it} + \beta_2V_{it} + \varepsilon_{it}$$

where V_{it} is stock volatility of company's stock i at time t; *IVit* is independent variables of company i at time t.

4.6.5 Analysis Techniques

Four methods of analysis were used to answer the research questions. They are descriptive analysis, multivariate analysis, multiple discriminant analysis, and mediation analysis. They were carried out using Excel, STATA, and SPSS. The following subsections explain the analysis techniques used in the study.

4.6.5.1 Diagnostic Analysis

The objective of diagnostic analysis is to ensure the validity of the research data and verify that the observations were consistent with the assumptions of the empirical analysis. Figure 4.2 shows that the flow of estimation in diagnostic analysis.

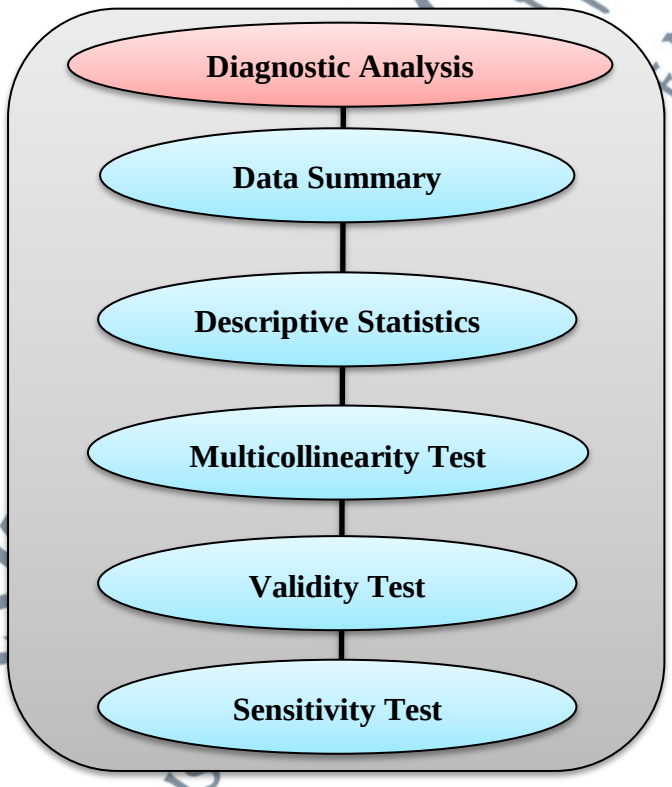

Figure 4.2: Flow of Estimation in Diagnostic Analysis

The diagnostic analysis explores the characteristics of the dataset, sample, observations, and analysing its mean, standard deviation, and minimum and maximum value. In addition, conducting the multicollinearity test, validity, and sensitivity.

4.6.5.2 Multivariate Analysis

The objective of multivariate analysis is to test the effect of accounting and market indicators on the companies' performance. Towards this end, the study employs balanced pooled and panel data analysis. Figure 4.3 shows that the flow of estimation in multivariate analysis.

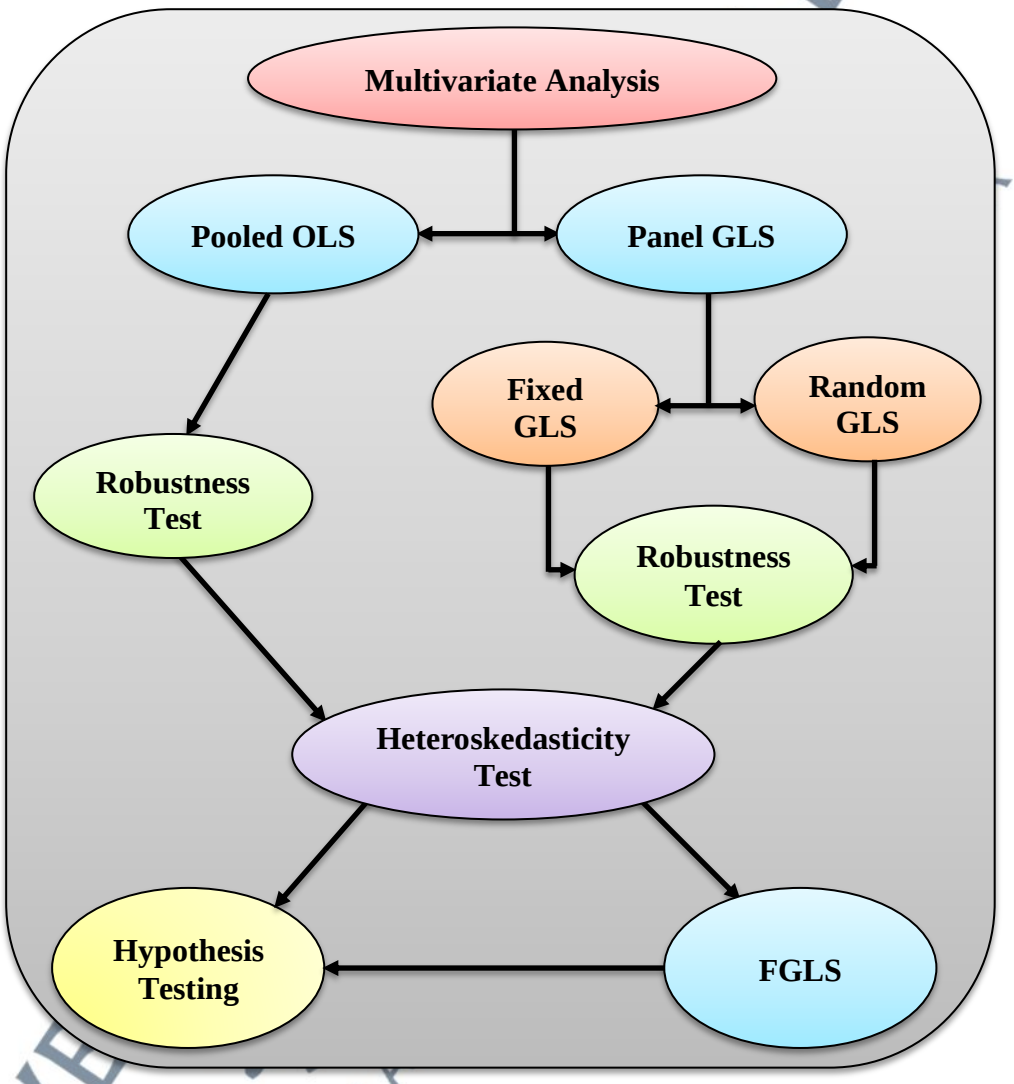

Figure 4.3: Flow of Estimation in Multivariate Analysis

In the pooled data analysis (OLS), all observations are set together and the regression coefficient explains the overall effect regardless of the time or any individual aspects (Gujarati, 2004). Whereas, the panel data analysis (GLS) is generally

predestined by random and fixed effects technique. In addition, the motive behind the use of three techniques is to find out the appropriate one that provides the best for the datasets (Gujarati, 2003). Thus, to differentiate between the random effects and the fixed effects, the researcher count on Hausman's test which also tests the null hypothesis that indicates that the coefficient estimated by the efficient random effects estimator are the same as the consistent fixed effect estimator's coefficients. Therewith, the rejection of the null hypothesis confirms that fixed effect model is more convenient than random effect model (Gujarati, 2004). As a result, the selection of the appropriate model could be conducted. Thus, all observations were analysed to determine the relationships between accounting and market indicators and company performance.

4.6.5.3 Multiple Discriminant Analysis

The multiple discriminant analysis technique intends to distinguish the sample companies into either performing or underperforming. The sample was discriminated by assessing its performance using specific accounting and market indicators. The study evaluates firm performance based on risk-return in the market because of the needs of investors. The Jensen's Alpha model was adopted to evaluate performance and distinguish between performing and underperforming companies. It is an important measurement to achieve the study objectives. By evaluating firm performance using historical data and splitting the sample into two groups, the dependent variable will fit the discriminant analysis assumptions. Using the Jensen's alpha model, market return was regressed to stock return to obtain α and β. If $\alpha > R_f\,(1-\beta)$, the company was categorised as performing (1); if $\alpha < R_f\,(1-\beta)$, it would be categorised as underperforming (0). The accounting and market indicators were selected based on theoretical models and previous research to ensure their validity and suitability for the

discriminant analysis. Figure 4.4 shows that the flow of estimation in multiple discriminant analysis (MDA).

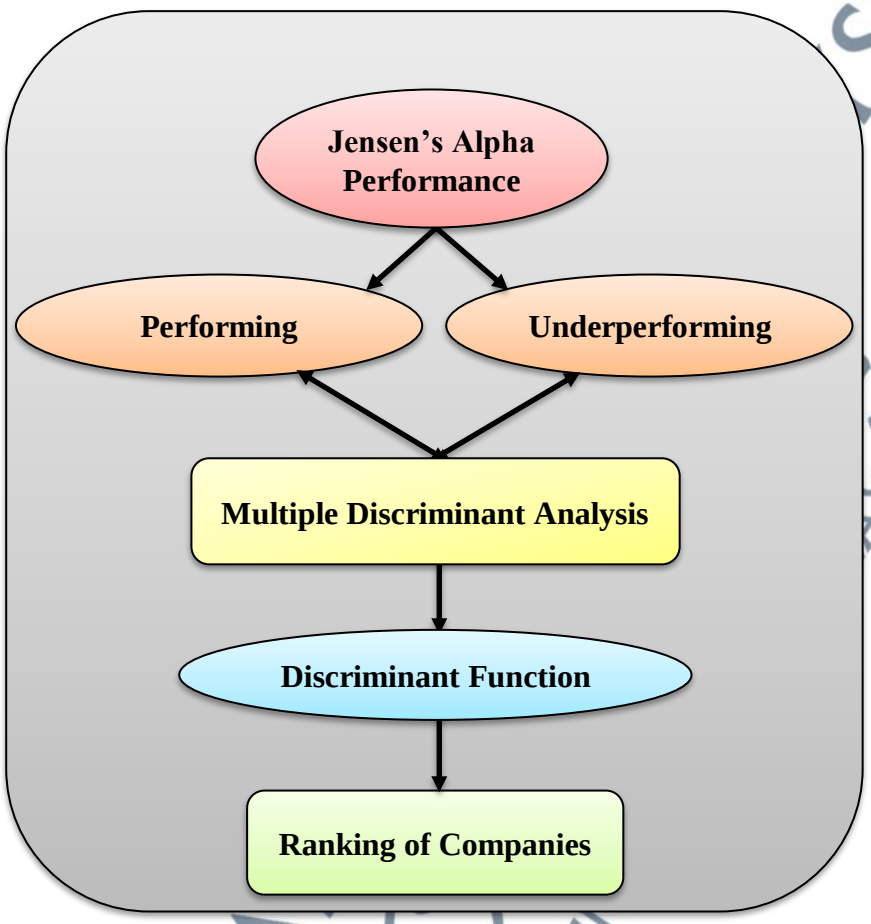

Figure 4.4: Flow of Estimation in Multiple Discriminant Analysis

The sample size was also determined to ensure the validity of the discriminant analysis. Most studies suggested a ratio of 20 observations for each predictor variable (Hair, Black, Babin, & Anderson, 2014, p. 240). In this regard, the researcher considered the sample size for analyses at the aggregate and group levels. After that, the researcher verified that the observations were consistent with the assumptions of the discriminant analysis. Box's M test was used to assess the whether the covariance matrices were significantly different across groups. If the assumptions were violated

and the potential remedies were unacceptable, the researcher would consider alternative methods e.g. logistic regression.

The next step was deriving the discriminant function through a stepwise procedure. The accounting and market indicators were inputted into the discriminant function to determine the extent to which each ratio (and the overall model) contributes to the variances between companies. At each step, the variables with the largest t-values were added to the subsequent model, and the process was repeated until all independent variables were exhausted. Variables that did not contribute to the predictive accuracy of the model were deleted. Wilks' lambda was used to determine the differences between groups. Significant differences in the value of Wilks' lambda were derived from the addition or deletion of any independent variables to the model. If $p < 0.05$, the groups are statistically different, which means that the independent variable(s) is a significant discriminator.

Finally, subject to the statistically significant discriminant function and acceptable classification accuracy, the results were further analysed. The discriminant functions were examined to determine the relative importance of each independent variable in discriminating between the groups. The companies were also ranked according to their discriminant scores in a descending order.

4.6.5.4 Mediation Analysis

The mediating effect of stock volatility was measured according to Baron & Kenny's (1986) proposed approach and the suggested modifications of Zhao, Lynch, & Chen (2010). Baron and Kenny (1986) proposed three steps to test mediation: 1) regress the mediator on the independent variables, 2) regress the dependent variable on the independent variables, and 3) regress the dependent variable on the independent

variable and mediator. The first and second model should result in the statistical significance of the independent variables. In the third model, the mediator should be statistically significant, but the independent variable should not be so.

However, Zhao, Lynch, & Chen (2010) argued that the significant relationship between the independent and dependent variables is unnecessary. They argued that mediation has to be evaluated independently of that relationship. Therefore, if the indirect effect is significant, mediation is established (they termed such a pattern as "indirect-only mediation"). Put simply, to demonstrate mediation, "all that matters is that the indirect effect is significant". Nevertheless, Mathieu & Taylor (2006) concluded that, if the direct effect of independent variable (Model three) weakens and becomes non-significant, while the mediator has a significant effect on the dependent variable, the mediation effect is considered full. If the direct effect of the independent variable (Model three) remains significant, the mediation effect is considered partial. This argument is presented in Figure 4.5: the effect of accounting and market indicators on company performance (C) through the mediation of volatility (A x B).

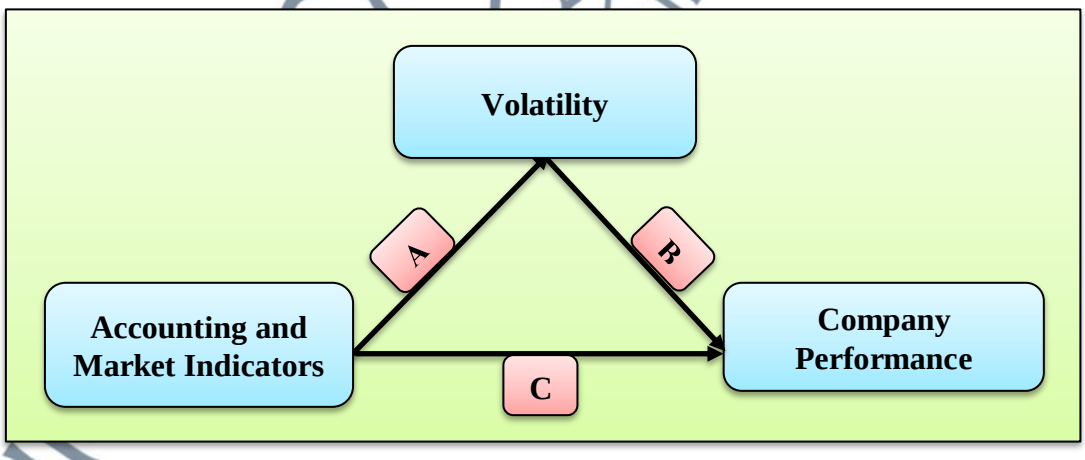

Figure 4.5: Effect through Mediation Analysis

In this study, the mediation analysis was carried out in a single step using structural equation modelling (SEM). Accounting and market indicators are expected

to enhance (reduce) volatility, which in turn is likely to affect company performance positively (negatively). Determining the positive or negative effect of the mediator was the objective of this analysis. Figure 4.6 shows that the flow of estimation in mediation analysis.

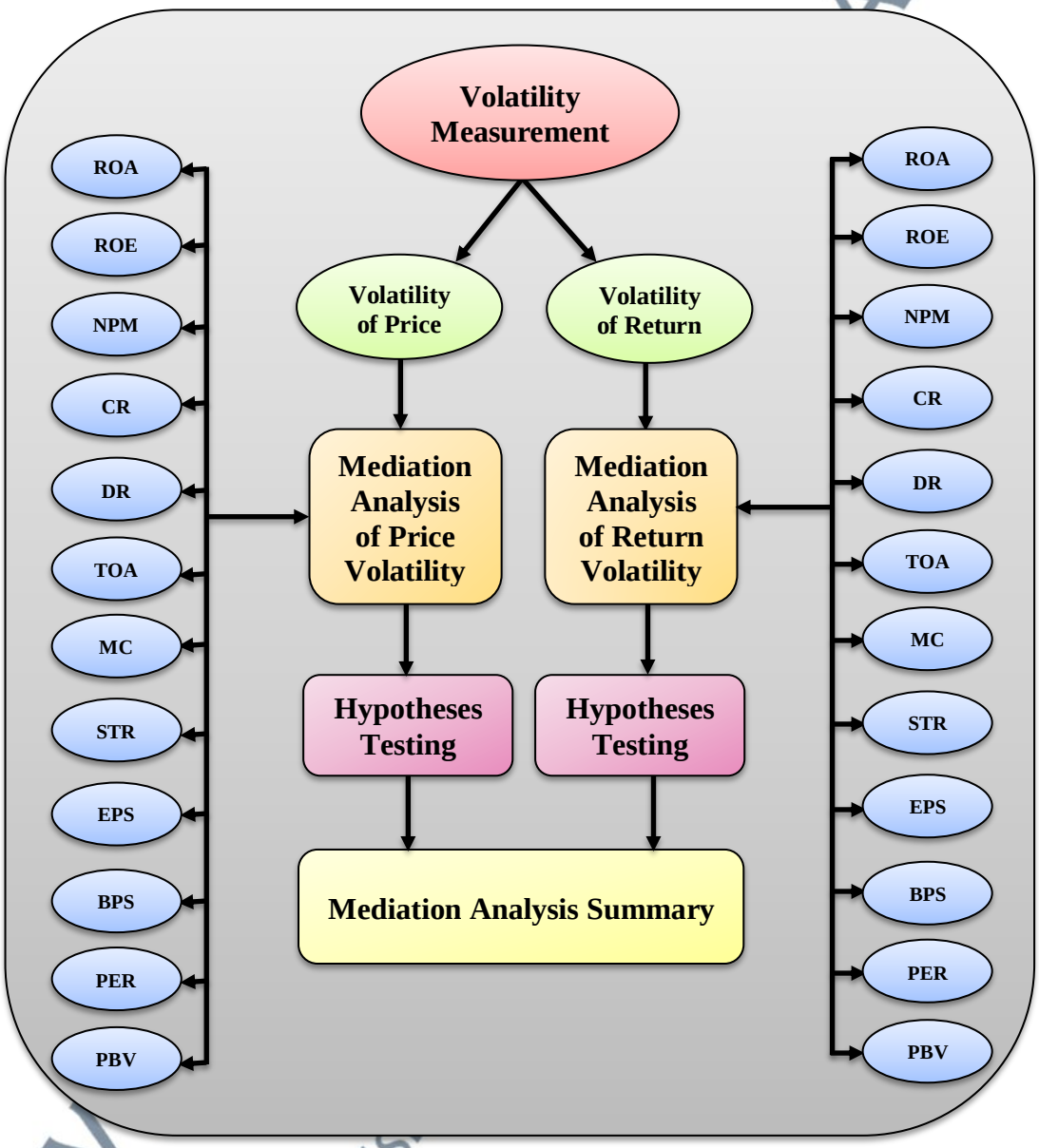

Figure 4.6: Flow of Estimation in Mediation Analysis

The significance of the mediation effect was verified using the Sobel test. Mediation analysis hypothesises that the direct relationship between the independent

and dependent variables is influenced by the indirect effect of a mediator. Therefore, when the mediator is introduced into the model, the effect of the independent variable is reduced while that of the mediator remains significant (Preacher & Hayes, 2008). The Sobel test is akin to a t-test that determines whether the reduced effect of the independent variable subsequent to the introduction of the mediator into the model is statistically significant, thereby confirming whether the mediation effect is statistically significant. Additionally, the Wald test (χ^2) was used to assess the model goodness-of-fit. The mediation analysis was carried out for both stock price and stock return models:

$$V_{it} = \alpha + \beta_1 I_{it} + \varepsilon_{it}$$

$$CP_{it} = \alpha + \beta_1 I_{it} + \beta_2 V_{it} + \varepsilon_{it}$$

where V_{it} is volatility for firm i at time t; I_{it} is the indicator for firm i at time t; CP_{it} is performance (*Pi* and *Ri*) for firm i at time t; α is the constant; and B_1, B_2 are parameters for the explanatory variables.

4.6.6 Unit of Analysis

The unit of analysis was divided into two. First, the companies that constitute the ASE Index as at 1 January 2019. Second, when measuring stock volatility, the individual companies that are part of the ASE Index.

4.7 Conclusion

This chapter has explained the research philosophy, methodology, and methods used to produce convincing answers for all research questions. The sample, data collection, variables, and empirical models used to examine the variables were also discussed. All the analysis techniques have been presented. Accounting and market indicators were expected to positively affect company performance, and stock volatility was posited to produce mediating effects. The next chapter will present the empirical results.