

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

The purpose of this section is to describe the methodology in order to test and obtain the results from the research questions, objectives, framework, and hypotheses. This study utilises the econometric techniques related to panel data analysis and mediating effects by using static, dynamic models and Structural Equation Modelling (SEM). The panel data analysis was performed using STATA software. The following section discusses in detail the sample, data collection, measurements of variables, and data analysis used in this study.

3.2 Sample of study

This study obtained the data from the Thomson Reuters database from the University Teknologi MARA (UiTM) system in 2017. The sample period of the study is from 2007 to 2016 (ten years). The data start from 2007 because the FTSE Bursa Malaysia EMAS Shariah Index replaced the KLSE Shariah Index in 2007 (Mohd-Sanusi et al., 2015). Therefore, there will be firms that are excluded and newly classified as Shariah compliant. From the total of 1020 Shariah-compliant firms from 2007 to 2016, after the arrangement, only 188 Shariah-compliant firms maintained listed status from 2007 to 2016 (Refer Table 3.1). After removing companies with insufficient information, only 181 from 188 were firms available (Refer Table 3.1).

The sample consists of Shariah-compliant firms from all sectors except for the financial sector of Bursa Malaysia because of its exclusive features in terms of financial

statements and business activities (Ali, Ibrahim, Mohammad, Zain, & Alwi, 2009). The list of the Malaysian Shariah-compliant firms is provided in Table A-1 (Refer Appendix 1).

Table 3.1: Sample of the Shariah Compliant firms for each sector from 2007 until 2016

No.	Sector	Total Shariah Compliant firms from 2007 until 2016	Total Shariah Compliant firms maintained for the 10 years from 2007 until 2016	Completed Data
1	Consumer Products	164	35	34
2	Industrial Products	335	60	58
3	Construction	73	19	19
4	Trading Services	249	38	35
5	Properties	140	18	17
6	Plantation	59	18	18
Total		1020	188	181

Source: Author (2018)

3.3 Model Specification

The Cook's distance has been used for the cleaning of data by identifying outliers to measure how much an observation influences the overall model or predicted values. It is the summary of the firm specific factors (which is a measure of how far an independent variable deviates from its mean) and high residual. If D is more than 1, it indicates a big outlier problem.

Figure 3.1 shows the mapping or direction of this study together with the model analysis for each objective. Before answer the research question and research objective of one, the static model were used to test the Cook's distance test based on OLS regression analysis, multicollinearity problem and explanatory power of regression models. The static model also were used for testing an appropriate model either pooled OLS, random effect or fixed effect model.

After selecting an appropriate model of analysis, this study perform diagnostic checks (heteroscedasticity and serial correlation). Based on rational expectation in sustainable growth rate (SGR), this study assumes the company maintains its target capital structure (TCS) and target dividend policy (TDP) which reflect the existence of both target capital structure (TCS) and target dividend policy (TDP). To answer objective one for the preliminary analysis, it is practically applicable to identify the existence of TCS and TDP. Then, the dynamic model were used to investigate the existence of the TCS and TDP based on GMM estimation by referring the value of the estimated coefficient of the lag capital structure and dividend policy (under speed of adjustment).

This study then continues analysis for objective two by using SEM to investigate the mediating effect of sustainable growth rate (SGR) on the relationship between firm specific factors (capital structure, dividend policy, profitability, company efficiency and firm size) and share price performance (SPP). Lastly (objective three), this study performs panel threshold regression analysis to examine whether there is a capital structure threshold in the relationship between capital structure and the sustainable growth rate (SGR) of Malaysian Shariah-compliant firms.

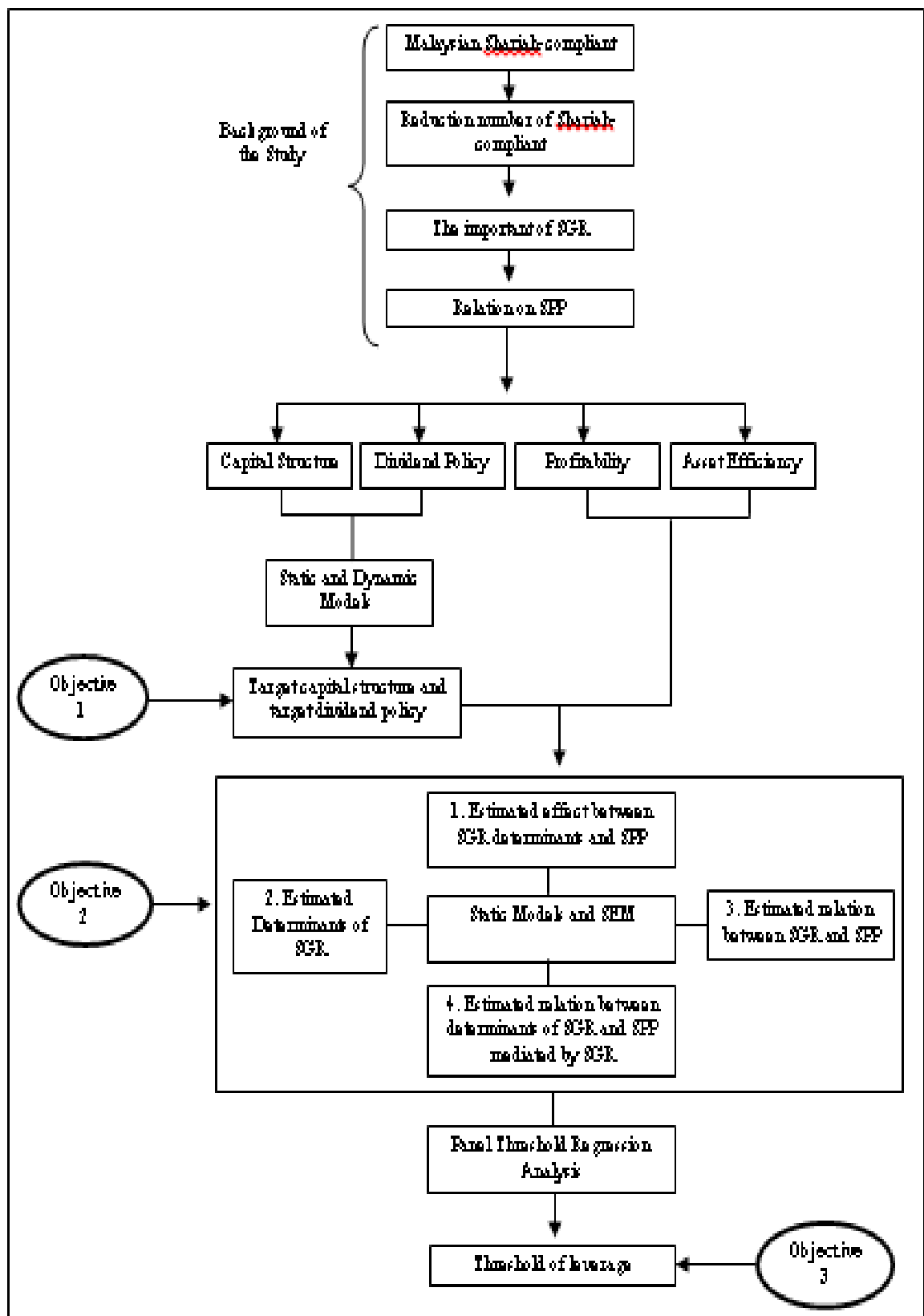


Figure 3.1: Mapping of the study and its implications

3.4 Objective One: Measuring the Existence of Target Capital Structure (TCS) and Target Dividend Policy (TDP)

3.4.1 Panel Data Analysis

This study uses the panel data method for objective one (1) to investigate the existence of the target capital structure (TCS) and target dividend policy (TDP) of Malaysian public-listed Shariah-compliant firms. This method allows the elimination of the unobservable heterogeneity for each observation in the sample of the study. There are two models of analysis, i.e. static and dynamic model. The first model provides an analysis that uses static models, such as pooled Ordinary Least Squares (OLS), Random Effect Model (REM), and Fixed Effect Model (FEM) (Refer to Figure 3.2 for the methodology process of the Static Models). The second model provides an analysis of the dynamic model, which is the Generalised Method of Moments (GMM). The panel data analysis includes the static and dynamic models that are run using the STATA software.

3.4.1.1 Static Model of Analysis

The framework for this analysis is a regression model of the form as follows:

$$Y_{it} = \beta_0 + \beta_1 X_{it} + \varepsilon_{it} \quad (1)$$

The pooled model pools all data together into one dataset and imposes a common set of parameters across unit and time. The pooled model essentially has the same intercept and slope across unit and time. However, the result of the pooled model may cause heterogeneity bias. Therefore, random and fixed effects will assume that each unit has its own intercepts. To solve such heterogeneity bias, the error term is formed as:

$$\varepsilon_{it} = \lambda_i + \mu_{it} \quad (2)$$

In order to apply random and fixed effects, the calculation is written as:

$$Y_{it} = \beta_0 + \beta_1 X_{it} + \lambda_i + \mu_{it} \quad (3)$$

To select the preferred model, Table 3.2 shows the statistical tests to choose the appropriate model in the context of the panel data analysis used in this study. This study uses three statistical tests – partial F-test, Breusch-Pagan LM test, and the Hausman test. Hence, it is important to select an appropriate model for further analysis, which are POLS, REM, or FEM – using the three statistical tests. The three statistical tests are as follows:

1) Pooled versus Fixed Effect Model

The fixed effect is when λ_i is uncorrelated with each variable (X_{it}), shown as $\text{Cor}(\lambda_i, X_{it}) = 0$. The hypotheses to choose either pooled OLS or fixed effect are as follows:

$$H_0: \sigma^2 \lambda = 0 \text{ (Pooled OLS model)}$$

$$H_1: \sigma^2 \lambda > 0 \text{ (Fixed effect)}$$

In order to choose either POLS or FE, the partial F-test is used to choose between the unrestricted panel models and the restricted panel model.

2) Pooled versus Random Effect Model

The random effect is when λ_i is uncorrelated with each variable (X_{it}) shown as $\text{Cor}(\lambda_i, X_{it}) = 0$. The hypotheses to choose either pooled OLS or random effect are as follows:

$$H_0: \sigma^2 \lambda = 0 \text{ (Pooled OLS model)}$$

$$H_1: \sigma^2 \lambda > 0 \text{ (Random effect)}$$

For POLS versus RE, the Breusch-Pagan LM test is used for testing the assumptions of variation of individual effect.

3) Pooled versus Fixed Effect Model

The fixed effect is when λ_i is correlated with each variable (X_{it}), shown as $Cor(\lambda_i, X_{it}) \neq 0$. The hypotheses to choose which one is more appropriate, i.e. random effects or fixed effects are as follows:

$$H_0: Cov(\lambda_i, X_{it}) = 0 \text{ (no correlation between } \lambda_i \text{ and } X_{it}: \text{ Random effect)}$$

$$H_1: Cov(\lambda_i, X_{it}) \neq 0 \text{ (correlation between } \lambda_i \text{ and } X_{it}: \text{ Fixed effect)}$$

For RE versus FE, the Hausman test is used to detect the significance of the difference between the two estimators either RE or FE.

Table 3.2: The statistical test in the context of panel data analysis

Fixed effect (F test)	Random effect (BP-LM test)	Hausman test	Appropriate model
H_0 is not rejected (No fixed effect)	H_0 is not rejected (no random effect)	-	Pooled OLS
H_0 is rejected (fixed effect)	H_0 is not rejected (no random effect)	-	Fixed effect model
H_0 is not rejected (No fixed effect)	H_0 is rejected (random effect)	-	Random effect model
H_0 is rejected (fixed effect)	H_0 is rejected (random effect)	H_0 is rejected (fixed effect)	Fixed effect model
H_0 is rejected (fixed effect)	H_0 is rejected (random effect)	H_0 is not rejected (random effect)	Random effect model

Notes: F test = Pooled OLS versus Fixed Effect; BP-LM test = Pooled OLS versus Random Effect, and; Hausman test = Random Effect versus Fixed Effect.

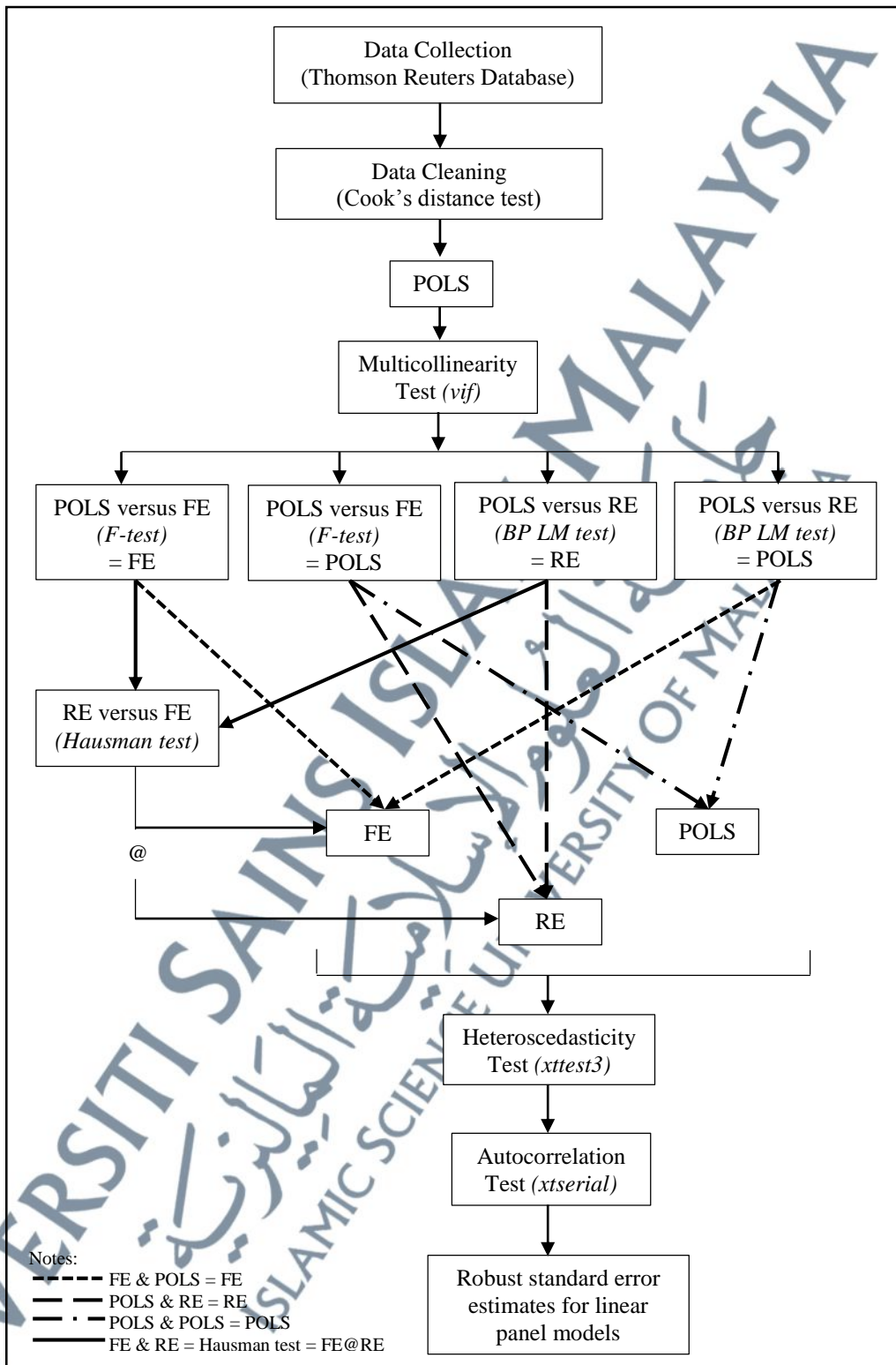


Figure 3.2: Methodology process of Static Models

Once the appropriate model is obtained, a few tests are performed for diagnostic checks, such as multicollinearity, heteroscedasticity, and serial correlation (autocorrelation) as follows:

1) Multicollinearity

Based on the multicollinearity test, if the mean variance inflation factor (*vif*) is greater than 10, then there is a multicollinearity problem. However, if the mean is less than 10, then there is no multicollinearity problem, which is consistent with the advantage of using the panel data where collinearity must be less.

2) Heteroscedasticity

For heteroscedasticity, the test is available for the fixed effect model and the null hypothesis rejection happens when the p-value is less than 0, which concludes that there is a heteroscedasticity problem.

3) Serial correlation (autocorrelation)

Another diagnostic check is the serial correlation, which can be tested using the Lagrange-multiplier test. The null hypothesis rejection happens when the p-value is less than 0, which concludes that the data does have the first-order autocorrelation. Lastly, the outlier test can be applied for an observation with large residual.

3.4.1.2 Dynamic Model of Analysis

The estimations for the dynamic regression model use GMM estimations on the data sets described above over the period 2007 until 2016. This study uses the GMM estimator by Arellano & Bond (1991) for investigating the existence of the target capital structure and the target dividend policy. This model is estimated using the Arellano and Bond dynamic panel GMM estimations (Stata command: xtabond) as follows:

$$Y^*_{i,t} = \delta_{\alpha} + (1 - \delta)Y_{i,t-1} + \delta\beta_1X1_{i,t} + \dots + \delta\beta_nXn_{i,t} + \lambda_t + n_t + \varepsilon_{it} \quad (4)$$

Based on Figure 3.3 below, the discussion focusses on the dynamic estimation model, i.e. the partial adjustment model, which is estimated using the two methods of Generalized Method of Moments (GMM), i.e. GMM-First Difference (1-step) and GMM-First Difference (2-step) by Arellano and Bond (1991).

Since the study uses two GMM methods as estimators for the dynamic model, the consistency of the GMM estimator depends on four diagnostic tests as follows:

- (i) Before beginning with the diagnostic tests, the number of instruments should be less than the number of companies or number of observations.
- (ii) In the serial correlation test in the disturbances (Arellano and Bond, 1991), the test should reject the null hypothesis of the absence of the first order serial correlation (AR1), but not reject the absence of the second order serial correlation (AR2). It is important to test the diagnostic test by referring to the autocorrelation or serial correlation, and the Sargan or Hansen test. Under autocorrelation, the null hypothesis of no autocorrelation in AR (2) must fail to be rejected, which is the p-value must be more than 5%. As further explanation, if first order correlation is present (since the p-value is less than 5%), it is correct and consistent with the GMM theory. Moreover, the null hypothesis of second

order serial correlation is failed to reject (p-value is more than 5%), which is in line with the GMM theory.

- (iii) According to the Sargan test of over-identifying restrictions, failure to reject the null hypothesis would imply that the instruments are valid and that the model is correctly specified. Meaning that the instrumental variables are not correlated with the error terms. In addition, the validity of the instruments can be tested using either the Sargan or Hansen tests of over-identifying restrictions. Then, this study proceeds with the results of the Sargan test or Hansen test in order to test the overidentification restriction. Under the Sargan or Hansen test, the overidentification restriction must be more than 5%. This indicates that the overidentifying restrictions are valid.
- (iv) The dynamic effect, which is the lag dependent, should be significant and less than 1. After going through the results of each diagnostic test, the most preferred estimator is then determined.

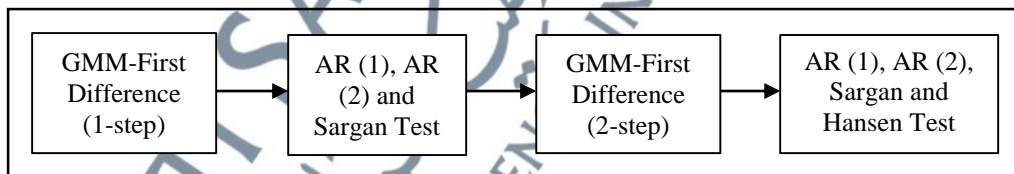


Figure 3.3: Methodology process of Dynamic Models

3.4.1.3 Target Capital Structure (TCS)

The capital structure is the combination of debt and equity that can maximise the firm value. The dependent variable for this study is capital structure. This study uses four measurements of capital structure where leverage 1 is defined as total debt to total equity (TDTE), leverage 2 is the total debt to total assets (TDTA), leverage 3 is the total conventional debt to total assets (TCDTA), and leverage 4 is the total Islamic debt to

total assets (IDTA). The reasons for the calculation of leverage 3 and leverage 4 is because the 33 percent of financial ratio benchmarks by the Securities Commission Malaysia consists of debt to total assets in which debt is regarding conventional debt only. Therefore, the calculation of leverage 2 in this research comprises both Islamic debt and conventional debt. Leverage 3 consists of conventional debt only while leverage 3 covers Islamic debt due to certain limitations. Then, the independent are presented by eight variables or firm specific factors of capital structure (non-debt tax shield, tangibility, profitability, business risk, firm's size, growth opportunities, liquidity and SPP) that influence the capital structure.

This study uses the panel data method to examine the existence of the target capital structure for Shariah-compliant firms by each sector. This study uses the GMM estimator by Arellano & Bond (1991) for investigating the existence of target capital structure (TCS). As mention earlier, the static model were used based on regression models to do the elimination of the unobservable heterogeneity for each observation in the sample of the study or to test an important results prior to testing the model. The static model were used to test the Cook's distance test based on OLS regression analysis, multicollinearity problem and explanatory power of regression models. This study uses the following model:

$$LEV_{i,t} = \alpha + \beta_1 NDT S_{i,t} + \beta_2 TANG_{i,t} + \beta_3 PROFIT_{i,t} + \beta_4 RISK_{i,t} + \beta_5 SIZE_{i,t} + \beta_6 GROWTH_{i,t} + \beta_7 LIQUIDITY_{i,t} + \beta_8 SPP_{i,t} + \varepsilon_{i,t} \quad (5)$$

where $LEV_{i,t}$ is the leverage ratio of firm I at time t ; $NDTS_{i,t}$ is the non-debt tax shield of firm I at time t ; $TANG_{i,t}$ is the tangibility of firm I at time t ; $PROFIT_{i,t}$ is the profitability of firm I at time t ; $RISK_{i,t}$ represents the business risk of firm I at time t ; $SIZE_{i,t}$ is the firm size of firm I at time t ; $GROWTH_{i,t}$ is the growth opportunities of

firm I at time t ; $LIQUIDITY_{i,t}$ is the liquidity of firm I at time t ; and $SPP_{i,t}$ is the share price performance of firm I at time t .

In addition, the advantage of using the dynamic model is that it allows for the relationship between the firm specific factors of capital structure and capital structure to be dynamic in nature. According to Ilgaz (2012), a firm has an incentive to correct the deviation from its target of leverage. A leverage change (at year t) would ideally correct the previous distance (at year $t-1$) from the target of leverage.

For investigating the existence of target capital structure (TCS) by using the GMM estimator, then, the dynamic regression model using panels containing many firms and a small number of time periods is presented as:

$$LEV_{i,t} - LEV_{i,t} = \delta(LEV^*_{i,t} - LEV_{i,t}) \quad (6)$$

Therefore, the dynamic regression model becomes:

$$LEV^*_{i,t} = \delta\alpha + (1 - \delta)LEV_{i,t-1} + \delta\beta_1NDTS_{i,t} + \delta\beta_2TANG_{i,t} + \delta\beta_3PROFIT_{i,t} + \delta\beta_4RISK_{i,t} + \delta\beta_5SIZE_{i,t} + \delta\beta_6GROWTH_{i,t} + \delta\beta_7LIQUIDITY_{i,t} + \delta\beta_8SPP_{i,t} + \lambda_i + \eta_t + \varepsilon_{i,t} \quad (7)$$

Where, δ is the adjustment speed, representing the magnitude of adjustment from actual to target capital structure. The δ is between 0 and 1, where, when $\delta_{i,t} = 0$, there is no adjustment to the target capital structure. But, when $\delta_{i,t} < 1$, an adjustment is required to attain the target, and when $\delta_{i,t} > 1$, it means the firms over-adjust, and therefore more adjustments than necessary are needed, which is still not at the optimal. To solve such heterogeneity bias, the error term can be formed as λ_i and η_t , which is an unobserved individual specific effect (two ways such as firm and time).

The dynamic estimation model, i.e. the partial adjustment model, is estimated using the two methods of Generalized Method of Moments (GMM), i.e. GMM-First

Difference (1-step) and GMM-First Difference (2-step) by Arellano and Bond (1991). The one-step estimator assumes independent error terms and homoscedastic error variances across individuals and times. The second-step estimator uses the residuals of the first-step estimation to construct a consistent variance-covariance matrix when the assumptions of independence and homoscedasticity do not hold. The consistency of the GMM estimator depends on the validity of the assumption that the error terms do not exhibit serial correlation (AR (2)) and on the validity of the instruments. The validity of the instruments can be tested using the Sargan or Hansen tests of over-identifying restrictions. The null hypothesis is that the overidentifying restrictions are valid, that is, the instrumental variables are not correlated with the error term. Failure to reject the null of the Sargan or Hansen test would imply that the instruments are valid and that the model is correctly specified.

Therefore, the hypothesis of objective one on target capital structure is

H1.1: A target capital structure exists in Malaysian Public-listed Shariah-compliant firms.

Moreover, this study also perform robustness test for objective two on under-leveraged and over-leveraged for Shariah-compliant firms in order to conducts a matrix financing behaviour on capital structure together with dividend policy. Based on the empirical literature, this study controls for the direction of the deviation from the target by dividing the sample based on whether the firm is over or underleveraged. Since instrumental variables are used in the estimation, separating the two groups aims to ensure that the instruments used for estimation are from the same group not the other group. To create the subsamples, the deviation from the target is calculated first based on the following relationship:

$$\text{Deviation} = \text{Observed leverage} - \text{Target leverage} \quad (8)$$

If the deviation is positive (negative), the firm is overleveraged (underleveraged). The target leverage is a function of firm characteristics; hence, it varies across firm and time. Since the leverage value is, by definition, bounded by minimum 0 and maximum 1, any fit value for the target leverage that is out of the sample observations is replaced by its actual value to be consistent with the defined boundaries (Abdeljawad & Mat Nor, 2017). Table 3.3 shows the detailed measurements of each variable for objective one in order to investigate the existence of the target capital structure. The measurements have been identified based on previous researchers and already discussed in detail in the previous chapter in the literature review.

Table 3.3: Measurement of Target Capital Structure and Explanatory Variables

No.	Variable	Measurement
Capital Structure:		
1.	Leverage 1	Total Debt over Total Equity
2.	Leverage 2	Total Debt over Total Assets
3.	Leverage 3	Total Conventional Debt over Total Assets
4.	Leverage 4	Total Islamic Debt over Total Assets
Explanatory Variable:		
1.	Non-Debt Tax Shield	Annual Depreciation Expenses over Total Assets
2.	Tangibility	Net Fixed Assets over Total Assets
3.	Profitability	EBIT over Total Assets
4.	Business Risk	Yearly Change of EBIT
5.	Firm Size	Natural Logarithm of Total Assets
6.	Growth Opportunities	Market Value of Equity to Book Value of Equity
7.	Liquidity	Current Assets over Current Liabilities
8.	Share Price Performance	First Difference of the Year End Share Price

Together these studies provide important insights into the target capital structure. In addition for robustness test, studies relating to deviation from the target have been few, as have the studies on under-leveraged and over-leveraged for Shariah-compliant firms. Thus, a three-step analysis is conducted under capital structure as follows:

- a) Firstly, this study focuses on the static model to test the Cook's distance test based on OLS regression analysis, multicollinearity problem, explanatory power of regression models, an appropriate model (either pooled OLS, random effect or fixed effect model) and diagnostic checks (heteroscedasticity and serial correlation).
- b) Secondly, this study perform dynamic estimation model to investigate the existence of target capital structure. From this step, the study identifies whether four types of leverage (i.e. debt to equity, debt to assets, conventional debt to assets, and Islamic debt to assets) have a target capital structure for the overall sample and each industry.
- c) Lastly, this study also perform robustness test for objective two to identify the under-leveraged or over-leveraged to conducts a matrix financing behaviour on capital structure together with dividend policy. There are four matrix financing behaviour on capital structure and dividend policy, i.e. (i) Over-levered (OL) and Under-paying of dividend (OP), (ii) Under-levered (UL) and Over-paying of dividend (OP), (iii) Over-levered (OL) and Under-paying of dividend (UP), and (iv) Under-levered (UL) and Under-paying of dividend (UP). After identifying the matrix financing behaviour capital structure and dividend policy, this study wants to know which matrix has more influence on SGR and SPP.

3.4.1.4 Target Dividend Policy (TDP)

This research uses the same way as target capital structure to examine the existence of the target dividend policy for Shariah-compliant firms. Firstly, the static model were used to test the Cook's distance test based on OLS regression analysis, multicollinearity problem, explanatory power of regression models, an appropriate model (either pooled OLS, random effect or fixed effect model) and diagnostic checks

(heteroscedasticity and serial correlation). The dependent variable for this study is dividend policy. The independent variables are presented by nine variables or firm specific factors (lagged dividend, earnings per share, market capitalization, investment opportunities, firm's size, sales growth, leverage and growth opportunities) that influence the dividend policy. The study assesses the Lintner extended type of dividend model based on Ahmed and Javid (2009). This research uses the following model:

$$DP_{i,t} = \beta_0 + \beta_1 DP_{i,t-1} + \beta_2 EPS_{i,t} + \beta_3 MV_{i,t} + \beta_4 LIQ_{i,t} + \beta_5 INV_{i,t} + \beta_6 SIZE_{i,t} + \beta_7 SG_{i,t} + \beta_8 LEV_{i,t} + \beta_9 GO_{i,t} + \varepsilon_{i,t} \quad (9)$$

Where $DP_{i,t}$ is the dividend policy of firm i at time t calculated as dividend per share divided by price per share represents dividend yield; $EPS_{i,t}$ represents earnings per share of firm i at time t ; $MV_{i,t}$ is the market capitalization of firm i at time t ; $LIQ_{i,t}$ is the liquidity calculated as current assets to current liabilities; $INV_{i,t}$ is investment opportunities calculated as accumulated retained earnings divided by total assets of the firm; $SIZE_{i,t}$ represents natural logarithm of total assets; $SG_{i,t}$ is the sales growth of firm i at time t ; $LEV_{i,t}$ is the leverage calculated as total debt to total assets, and $GO_{i,t}$ represents the market to book value of equity. This study could not use the payout ratio as a measurement of the dependent variable because the sample of analysis contains firms with negative earnings.

Secondly, the partial adjustment model of Lintner (1956) were used to examine the existence of the target dividend policy for Shariah-compliant firms. Based on Lintner, each firm (i) has a target dividend payout ratio (r_i) for which this research uses the following model:

$$D_{i,t}^* = r_i E_{i,t} (E_{i,t}) \quad (10)$$

Where $D_{i,t}^*$ the target dividend policy is calculated the target dividend at time t and $E_{i,t}$ as a percentage of the net earnings of the firms i at time t . In reality, the dividend payment of firms finally pays at time t ($D_{i,t}$), which is different from the target dividend policy ($D_{i,t}^*$). Hence, this is the reason to change the model between the real dividend at time t_{-1} rather than using real dividend at time t only. Using the change in real dividend is more accurate and consistent with the long-run target dividend policy, hence, the study assumes that the real dividend at time t ($D_{i,t} - D_{i,t-1}$) is equal to the constant portion ($\alpha_{i,t}$) plus the speed of adjustment to the target dividend at time t ($D_{i,t}^* - D_{i,t-1}$). As the target dividend at time t is a proportion of the net earnings at time t , the final model is given below:

$$D_{i,t} - D_{i,t-1} = \alpha_{i,t} + c_i r_i E_{i,t} - c_i D_{i,t-1} \quad (11)$$

Where $D_{i,t}$ is the actual dividend paid by the firms during period t ; $E_{i,t}$ is the net earnings of the firms during the period t ; c_i is the adjustment factor, which shows the speed of adjustment of dividend at the time t_{-1} to the optimum target dividend policy of dividends at time t , and r_i is the target dividend policy. Therefore, this theoretical model can be assessed by using an econometric model as follows:

$$\Delta D_{i,t} = \alpha_{i,t} + \beta_1 E_{i,t} + \beta_2 D_{i,t-1} + \varepsilon_{i,t} \quad (12)$$

Where $\Delta D_{i,t}$ is the change in dividend from time t_{-1} for the firm i ; β_1 is the c_i and β_2 represents the c_i in the theoretical model, and $\varepsilon_{i,t}$ is the error term.

By referring to Ahmed and Javid (2008), and Naceur et al. (2006), Lintner uses dividend per share and earnings per share to test the model. The study estimates the model using the dependent variable, as $DPS_{i,t}$ is the dividend per share of firm i at time t and $EPS_{i,t}$ is earnings per share for firm i at time t as the explanatory variables.

Thus, the model becomes as follows:

$$DPS^*_{i,t} = \delta\alpha + (1 - \delta)DPS_{i,t-1} + \delta\beta_1EPS_{i,t} + \lambda_i + \eta_t + \varepsilon_{i,t} \quad (13)$$

Table 3.4 shows the detailed measurements of each variable of objective one in order to investigate the existence of the target dividend policy. The measurements have been identified based on previous researchers and has been discussed in detail in the previous chapter on literature review.

Table 3.4: Measurement of Target Dividend Policy and Explanatory Variables

No.	Variable	Measurement
Dividend Policy:		
1.	DPS	Total dividend over no. of shares
2.	DY	Dividend per share over price per share
3.	DPR	Dividend per share over earnings per share
Explanatory Variable:		
1.	EPS	Net income minus preferred div to no. of shares
2.	MC	Natural log of market capitalization
3.	LIQ	Current Assets over Current Liabilities
4.	INV	Accumulated Retained Earnings over Total Assets
5.	SIZE	Natural Logarithm of Total Assets
6.	SG	Yearly change on Net Sales
7.	LEV	Total Debt over Total Assets
8.	GO	Market Value of Equity to Book Value of Equity

Therefore, the hypothesis of objective one on target dividend policy is

H1.2: A target dividend policy exists in Malaysian Public-listed Shariah-compliant firms.

Lastly, continue on robustness test under target capital structure (under-leveraged and over-leveraged), this study perform robustness test for objective two in order to conducts a matrix financing behaviour on capital structure together with dividend policy.

This study controls for the direction of the deviation from the target by dividing the sample based on whether the firm is under-paying and over-paying. Since instrumental variables are used in the estimation, separating the two groups aims to ensure that the instruments used for estimation are from the same group and not the other group. To create the subsamples, the deviation from the target is calculated first based on the following relationship:

$$\text{Deviation} = \text{Observed dividend} - \text{Target dividend} \quad (14)$$

If the deviation is positive (negative), the firm is over-paying (underpaying). The target dividend policy is a function of firm characteristics; hence, it varies across firm and time. Since dividend policy value is, by definition, bounded by minimum 0 and maximum 1, any fit value for the target dividend policy that is out of the sample observations is replaced by its actual value to be consistent with the defined boundaries.

Overall, there are three-step analysis is conducted on target dividend policy, which is similar to the steps under the target capital structure, as follows:

- a) Firstly, this study focuses on the static model to test the Cook's distance test based on OLS regression analysis, multicollinearity problem, explanatory power of regression models, an appropriate model (either pooled OLS, random effect or fixed effect model) and diagnostic checks (heteroscedasticity and serial correlation).
- b) Secondly, this study perform dynamic estimation model on partial adjustment model to investigate the existence of target dividend policy.
- c) Lastly, this study perform robustness test for objective two to identify the under-paying and over-paying to conducts a matrix financing behaviour on capital structure together with dividend policy. There are four matrix financing behaviour on capital structure and dividend policy, i.e. (i) Over-levered (OL) and Under-paying of dividend (OP), (ii) Under-levered (UL) and Over-paying of dividend

(OP), (iii) Over-levered (OL) and Under-paying of dividend (UP), and (iv) Under-levered (UL) and Under-paying of dividend (UP). After identifying the matrix financing behaviour capital structure and dividend policy, this study wants to know which matrix has more influence on SGR and SPP.

3.5 Objective Two: The mediating effect of sustainable growth rate (SGR) on the relationship between firm specific factors (capital structure, dividend policy, profitability, company efficiency and firm size) and share price performance (SPP)

3.5.1 SEM for Mediation Analysis

The analysis covers the Structural Equation Model (SEM) using STATA software. Structural equation modeling (SEM) was applied to estimate direct and indirect effects with the STATA software (Hussain et al., 2017; and Gu, Cao & Wang, 2019). This study adopted this approach as a suitable means to answer our research questions.

This study refers to the procedures by Baron and Kenny (1986) in testing the mediating effects, while taking into consideration the recent modifications and comments suggested by Hayes (2013; 2017), and Zhao et al. (2010). This study examines the mediating effect of sustainable growth rate (SGR) on the relationship between firm specific factors (capital structure, dividend policy, profitability, company efficiency and firm size) and share price performance (SPP). By referring to Figure 3.4, the requirement must be met for the mediation effect based on Baron and Kenny (1986), Iacobucci and Duhachek (2003), and Maackinnon et al. (1995), i.e. the indirect path “a” and “b” should be significant; the relationship between the path coefficients of firm

specific factors and SGR can be significant or non-significant (path c); Path c (total direct effect) does not need to be significant.

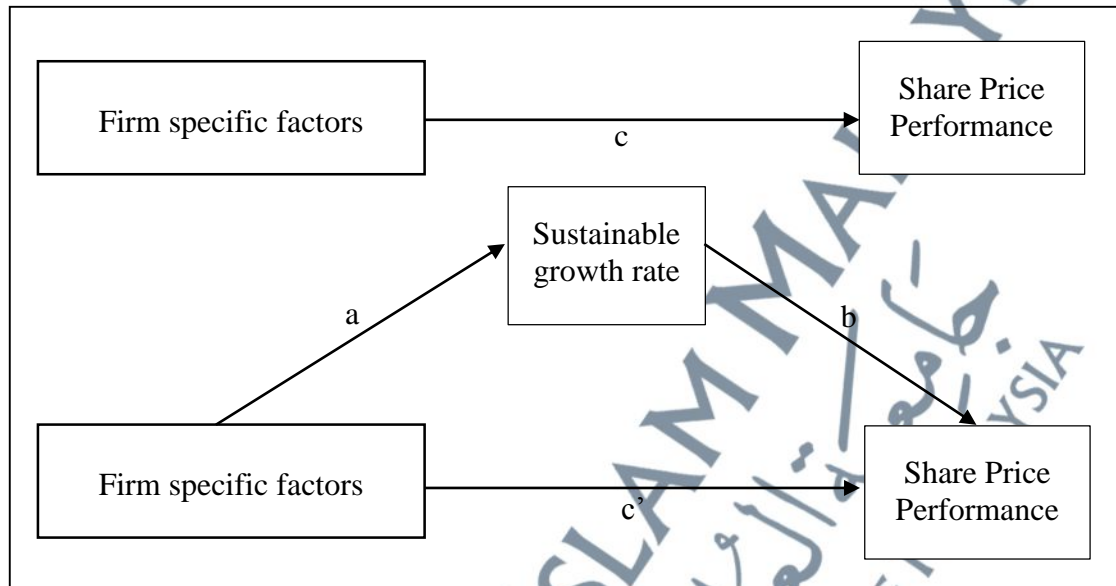


Figure 3.4: Mediation effect

The study by Hayes (2013; 2017), and Zhao et al. (2010), were followed step-by-step in this study to run the regression analysis, which involved the mediating variables. The mediating effects can also be called the indirect effects, for example, the relationship between firm specific factors and SPP, which are mediated by SGR. The steps for the mediation effects analysis were:

Firstly, a simple regression analysis to analyse the direct effect between the independent and dependent variables was conducted. The equation model used is as follows:

$$Y = \beta_0 + \beta_1 X + e \tag{15}$$

$$Y = \beta_0 + \beta_1 X + \beta_2 Z + \beta_3 XZ + e \tag{16}$$

Secondly, a simple regression analysis to test the direct effect between the independent and mediating variables was performed. The equation model used is as follows:

$$M = \beta_0 + \beta_1 X + e \quad (17)$$

$$M = \beta_0 + \beta_1 X + \beta_2 Z + \beta_3 XZ + e \quad (18)$$

Lastly, a multiple regression analysis to analyse the effect between the independent and mediating variables with the dependent variable is performed.

$$Y = \beta_0 + \beta_1 X + \beta_2 M + e \quad (19)$$

$$Y = \beta_0 + \beta_1 X + \beta_2 Z + \beta_3 XZ + \beta_4 M + \beta_5 MZ + e \quad (20)$$

A few statistical tests need to be conducted after running the regression coefficient for the indirect effect. The parameters used for the analysis can be estimated by using two OLS regression analyses (Hayes, 2013).

3.5.2 Endogenous and Mediating variables

1) Sustainable Growth Rate (SGR)

In this study, SGR is the endogenous and mediating variable. The measurement to calculate SGR is based on the Higgins model equations. Previous studies used the Higgins model to calculate SGR (Turvey, & Barry, 2009; Amouzesh et al., 2011; Molly, Laveren, & Jorissen, 2011; Fonseka et al., 2012; Chen, Gupta, Lee, & Lee, 2013; Cahyo Hartono & Rahmi Utami, 2016; Escalante, Hafid, 2016).

The decomposition of the SGR model can be obtained by calculating the return on equity and multiplying it by the retention ratio (Zantout, 1990), as follows:

$$\begin{aligned}
\Delta S/S &= \frac{p(1-d)(1+L)}{t-p(1-d)(1+L)} \\
&= \frac{(NI/S)(1-d)(1+D/E)}{(TA/S) - (NI/S)(1-d)(1+D/E)} \\
&= \frac{(NI)(1-d)(TA/E)}{(TA) - (NI)(1-d)(TA/E)} \\
&= \frac{(NI/E)(1-d)}{1 - (NI/E)(1-d)} \\
&= \frac{(NI)(1-d)}{E - (NI)(1-d)} \\
&= \frac{(NI)(1-d)}{\text{Beginning of Year Stockholder's Equity}} \\
&= ROE \times (1-d) \\
&= ROE \times RR
\end{aligned} \tag{21}$$

Where, p is the profit margin on new and existing sales after taxes, d is the target dividend payout ratio [$(1-d)$ therefore is the target retention ratio], L is the the target total debt to equity ratio, t is the the ratio of total assets to net sales on new and existing sales, S is the sales at the beginning of the year, and ΔS is the increase in sales during the year. NI is the Net Income, D is the Total Debt, E is the Total Equity, TA is the Total Assets, ROE is the Return on equity, and RR is the Retention Ratio.

2) Share Price Performance (SPP)

In addition, the SPP is the endogenous and the measurement used in this study is the calculation of SPP based on the previous study by Lockwood and Prombutr (2010). SPP is measured as the first difference of the year end share price (Haron and Ibrahim, 2012).

The calculation of SPP is as follows:

$$SPP = \frac{P_1 - P_0}{P_0} \tag{22}$$

Where, P_0 is the share price at the beginning price of a year, and P_1 is the share price at the ending price of a year.

3.5.3 Exogenous variables

SGR is calculated as the earnings retention ratio (RR) multiplied with the return on equity ($SGR = ROE \times RR$). Taking into account that ROE is a function of profitability, asset efficiency and equity multiplier (reflecting capital structure), and RR is a measure of Dividend policy. Then, a famous framework for SGR developed by Higgins (1977) discusses four main factors that influence SGR which is capital structure, dividend, profitability, and company efficiency. While, firm size is recognized as the most significant function of the firm growth due to cost differentials between small and large firms (Bentzen, Madsen and Smith, 2012). Firm size had significant negative relationship with SGR (Mamilla, 2019; Lockwood and Prombutr, 2010). Hence, there are five exogenous variables or firm specific factors in this study which is capital structure, dividend policy, profitability, company efficiency and firm size. The details of the measurements of the exogenous variables are as below.

1) Capital Structure

This study uses four measurements of capital structure which is leverage 1 (TDTE), leverage 2 (TDTA), leverage 3 (TCDTA), and leverage 4 (IDTA). The calculation of capital structure where leverage 1 is defined as total debt to total equity (TDTE), leverage 2 is the total debt to total assets (TDTA), leverage 3 is the total conventional debt to total assets (TCDTA), and leverage 4 is the total Islamic debt to total assets (IDTA).

2) Dividend policy

The measurement of dividend policy is dividend payout ratio is calculated as dividend per share over earnings per share.

3) Net Profit Margin

NPM measures the profitability after considering all the expenses incurred by a firm during a certain period. A higher ratio means greater profitability and better control of the firm's expenses (Titman, 2014). NPM is calculated as the net income divided by sales.

4) Company Efficiency

Company's efficiency can be defined as a firm's efficiency in managing its assets in relation to the revenue generated by calculating it as total assets to sales.

5) Firm size

The important of firm size (Amouzesh et al., 2011; Brick et al., 2016; Park & Jang, 2010; Sánchez-Vidal, 2014) can be observed as it can have a positive or negative effect on the highest quantiles. Firm size can be defined as the size of a business firm generated by calculating the natural logarithm of total assets.

This study estimates four models to find the appropriate model that provides important factors in order to give a better explanation of their influence on SGR and SPP. The analysis based on four models because there are four measurements of capital structure (leverage 1 (TDTE), leverage 2 (TDTA), leverage 3 (TCDTA), and leverage 4 (IDTA)). The details of model with a different set of capital structure stated as below

- 1) Model 1 - leverage 1 (TDTE),
- 2) Model 2 - leverage 2 (TDTA),
- 3) Model 3 - leverage 3 (TCDTA), and
- 4) Model 4 - leverage 4 (IDTA).

Table 3.5 provides the detailed description of the research variables for the dependent and independent variables for objective two.

Table 3.5: Description of the Research Variables for the Endogenous and Exogenous Variables

Variable	Acronym	Description
Endogenous and mediating variable:		
Sustainable Growth Rate	SGR (Y, M)	Sustainable growth rate as measured by Return on Equity multiple with Retention Ratio. The calculation of the Retention Ratio is one minus the dividend payout ratio. This calculation of sustainable growth rate is based on the Higgins model.
Share price performance	SPP (Y)	Share price performance is measured by change in first difference of the year end share price. The calculation of SPP is the ending share price minus beginning share price and divided by the beginning share price
Exogenous variables:		
Capital Structure	CS (X) - TDTE - TDTA - TCDTA - IDTA	The calculation of leverage as follows:- - Leverage 1 is total debt over total equity - Leverage 2 is total debt over total assets - Leverage 3 is total conventional debt over total assets - Leverage 4 is total islamic debt over total assets
Dividend Policy	DPR (X)	The calculation of dividend policy is by calculating the dividend payout ratio as dividend per share over earnings per share.
Profitability: Net profit margin	NPM (X)	NPM is calculated as net income divided by sales.
Company Efficiency	ATS (X)	Defined as a firm's efficiency in managing its assets in relation to the revenue generated calculated as total assets to sales.
Firm size	SIZE (X)	The logarithm of the total assets.

Therefore, Table 3.6 summarizes the hypotheses of objective two for the mediation effect and analyses each step for each of the analyses. Refer Table 2.15 for the details hypotheses of objective two.

Table 3.6: Summary of the Hypotheses of Objective Two

Step	Hypotheses	Details	Analysis
Step 1	Hypothesis 2.1	Firm specific factor and SPP (H2.1a – H2.1e).	Firm specific factor have a significant relationship with SPP.
Step 2	Hypothesis 2.2	Firm specific factor and SGR (H2.2a – H2.2e).	Firm specific factor have a significant relationship with SGR.
Step 3	Hypothesis 2.3	SGR and SPP (H2.3)	SGR of firm has a negative/positive relationship with SPP.
Step 4	Hypothesis 2.4	Indirect/mediating effects. (H2.4a – H2.4e).	SGR has an indirect/mediating effect on the relationship between the firm specific factor and SPP.

The equation of four models with a different set of exogenous variables in capital structure are described as follows:

i. Model 1, the model with Leverage 1 (TDTE).

$$\text{Step 1} : SPP_{i,t} = \beta_0 + \beta_1 TDTE_{i,t} + \beta_2 DPR_{i,t} + \beta_3 NPM_{i,t} + \beta_4 ATS_{i,t} + \beta_5 SIZE_{i,t} + \varepsilon_{i,t} \quad (23)$$

$$\text{Step 2} : SGR_{i,t} = \beta_0 + \beta_1 TDTE_{i,t} + \beta_2 DPR_{i,t} + \beta_3 NPM_{i,t} + \beta_4 ATS_{i,t} + \beta_5 SIZE_{i,t} + \varepsilon_{i,t} \quad (24)$$

$$\text{Step 3} : SPP_{i,t} = \beta_0 + \beta_1 SGR_{i,t} + \varepsilon_{i,t} \quad (25)$$

$$\text{Step 4} : SPP_{i,t} = \beta_0 + \beta_1 SGR_{i,t} + \beta_2 TDTE_{i,t} + \beta_3 DPR_{i,t} + \beta_4 NPM_{i,t} + \beta_5 ATS_{i,t} + \beta_6 SIZE_{i,t} + \varepsilon_{i,t} \quad (26)$$

ii. Model 2, the model with Leverage 2 (TDTA).

$$\text{Step 1} : SPP_{i,t} = \beta_0 + \beta_1 TDTA_{i,t} + \beta_2 DPR_{i,t} + \beta_3 NPM_{i,t} + \beta_4 ATS_{i,t} + \beta_5 SIZE_{i,t} + \varepsilon_{i,t} \quad (27)$$

$$\text{Step 2} : SGR_{i,t} = \beta_0 + \beta_1 TDTA_{i,t} + \beta_2 DPR_{i,t} + \beta_3 NPM_{i,t} + \beta_4 ATS_{i,t} + \beta_5 SIZE_{i,t} + \varepsilon_{i,t} \quad (28)$$

$$\text{Step 3} : SPP_{i,t} = \beta_0 + \beta_1 SGR_{i,t} + \varepsilon_{i,t} \quad (29)$$

$$\text{Step 4} : SPP_{i,t} = \beta_0 + \beta_1 SGR_{i,t} + \beta_2 TDTA_{i,t} + \beta_3 DPR_{i,t} + \beta_4 NPM_{i,t} + \beta_5 ATS_{i,t} + \beta_6 SIZE_{i,t} + \varepsilon_{i,t} \quad (30)$$

iii. Model 3, the model with Leverage 3 (TCDTA).

$$\text{Step 1 : } SPP_{i,t} = \beta_0 + \beta_1 TCDTA_{i,t} + \beta_2 DPR_{i,t} + \beta_3 NPM_{i,t} + \beta_4 ATS_{i,t} + \beta_5 SIZE_{i,t} + \varepsilon_{i,t} \quad (31)$$

$$\text{Step 2 : } SGR_{i,t} = \beta_0 + \beta_1 TCDTA_{i,t} + \beta_2 DPR_{i,t} + \beta_3 NPM_{i,t} + \beta_4 ATS_{i,t} + \beta_5 SIZE_{i,t} + \varepsilon_{i,t} \quad (32)$$

$$\text{Step 3 : } SPP_{i,t} = \beta_0 + \beta_1 SGR_{i,t} + \varepsilon_{i,t} \quad (33)$$

$$\text{Step 4 : } SPP_{i,t} = \beta_0 + \beta_1 SGR_{i,t} + \beta_2 TCDTA_{i,t} + \beta_3 DPR_{i,t} + \beta_4 NPM_{i,t} + \beta_5 ATS_{i,t} + \beta_6 SIZE_{i,t} + \varepsilon_{i,t} \quad (34)$$

iv. Model 4, the model with Leverage 4 (IDTA).

$$\text{Step 1 : } SPP_{i,t} = \beta_0 + \beta_1 IDTA_{i,t} + \beta_2 DPR_{i,t} + \beta_3 NPM_{i,t} + \beta_4 ATS_{i,t} + \beta_5 SIZE_{i,t} + \varepsilon_{i,t} \quad (35)$$

$$\text{Step 2 : } SGR_{i,t} = \beta_0 + \beta_1 IDTA_{i,t} + \beta_2 DPR_{i,t} + \beta_3 NPM_{i,t} + \beta_4 ATS_{i,t} + \beta_5 SIZE_{i,t} + \varepsilon_{i,t} \quad (36)$$

$$\text{Step 3 : } SPP_{i,t} = \beta_0 + \beta_1 SGR_{i,t} + \varepsilon_{i,t} \quad (37)$$

$$\text{Step 4 : } SPP_{i,t} = \beta_0 + \beta_1 SGR_{i,t} + \beta_2 IDTA_{i,t} + \beta_3 DPR_{i,t} + \beta_4 NPM_{i,t} + \beta_5 ATS_{i,t} + \beta_6 SIZE_{i,t} + \varepsilon_{i,t} \quad (38)$$

Where, $SPP_{i,t}$ is the Share price performance, $SGR_{i,t}$ is the sustainable growth rate based on the Higgins model calculation (return on equity multiply retention ratio) of firm i at time t , $TDTE_{i,t}$ is the total debt to total equity, $TDTA_{i,t}$ is the total debt to total assets, $TCDTA_{i,t}$ is the total conventional debt to total assets, $IDTA_{i,t}$ is the Islamic debt to total assets, all represents capital structure, $DPR_{i,t}$ is the dividend payout ratio and represents dividend policy, $NPM_{i,t}$ is the profit margin of firm i at time t and represents profitability, $ATS_{i,t}$ is the assets to sales ratio of firm i at time t and represents company efficiency, and $SIZE_{i,t}$ is the natural log of total assets of firm i at time t and represents firm size.

The results of the mediation effect are based on the typology of mediation (refer Table 3.7 for details).

Table 3.7: A Typology of Mediations

Types of mediation	Description
Complementary mediation	The indirect effect (<i>path: a×b</i>) and direct effect (<i>path c</i>) are both significant and the signs point in the same direction.
Competitive mediation	The indirect effect (<i>path: a×b</i>) and direct effect (<i>path c</i>) are both significant and the signs point in the opposite direction.
Indirect-only mediation	The indirect effect (<i>path: a×b</i>) is significant, but the direct effect (<i>path c</i>) is not significant.
Direct-only non-mediation	The indirect effect (<i>path: a×b</i>) is not significant, but the direct effect (<i>path c</i>) is significant.
No-effect non-mediation	Neither the indirect nor the direct effect is significant.

Source: Zhao (2010); Ramli (2014; 2018)

3.6 Robustness Tests

The following is the robustness test based on two parts of the analysis, i.e. Industry and Matrix financing behaviour on under-levered, over-levered, under-paying, and over-paying of dividend.

a) Industry

Regarding the industry, understanding the growth patterns of the industry is essential for establishing sustainable growth strategies (Park & Jang, 2010). In addition, the different industries have different characteristics and business activities. This study is estimated by six sectors such as consumer products, industrial products, construction, trading services, properties and plantation. The robustness test is used under objective one (target capital structure and target dividend policy) and objective two (the mediating effect of SGR on the relationship between firm specific factors (capital structure, dividend policy, profitability, company efficiency and firm size) and SPP.

b) Matrix financing behaviour on under-levered, over-levered, under-paying, and over-paying of dividend.

Section 3.4.1.3 (target capital structure) and 3.4.1.4 (target dividend policy) already discussed the deviation from the target capital structure and target dividend policy. Thus, this study investigates extensively the impact when a firm is over-leveraged, under-leveraged, over-paying, and under-paying of dividend on the SGR and SPP.

Matrix financing behaviour on under-levered (ul), over-levered (ol), under-paying (up) and over-paying (op) of dividend.		
OP\OL	OL	UL
OP	1	2
UP	3	4

Figure 3.5: Matrix financing behaviour on under-levered, over-levered, under-paying, and over-paying of dividend.

Based on Figure 3.5 above, the matrix financing behaviour have been introduced and the study discusses the results under the robustness tests in Chapter 4 based on four categories, which are when the firms are (i) Over-levered (OL) and Over-paying of dividend (OP), (ii) Under-levered (UL) and Over-paying of dividend (OP), (iii) Over-levered (OL) and Under-paying of dividend (UP), and (iv) Under-levered (UL) and Under-paying of dividend (UP). Therefore, there are gaps in prior research in the matrix situations of financial behaviours towards the firm's SGR. This study investigates whether the different matrix situations of financial behaviours have different results on the relation between the firm specific factors and SPP, the relation between the firm specific factors and SGR, the relation between the SGR and SPP, and the mediating effect of the SGR on the relationship between the firm specific factors and SPP.

3.7 Objective Three: Threshold Regression Analysis

The threshold regression model was used in this study based on the studies by Hansen (1999, 2000), and Kremer, Bick, and Nautz (2013). Its concept is that this type of modelling strategy allows the role of the threshold variable to differ depending on whether the variable is below or above the level of the threshold.

3.7.1 Static panel threshold regression

There are four measurements of capital structure which is leverage 1 (TDTE), leverage 2 (TDTA), leverage 3 (TCDTA), and leverage 4 (IDTA) treated as the threshold variable to determine whether there is a capital structure threshold in the relationship between capital structure and SGR. The control variable is used to control for other factors, namely, dividend policy, profitability, company efficiency and firm size that could hypothetically influence the SGR. These proxies were used by Higgins (1977).

First, since the data series are in panel form, this study employs panel unit root tests to determine whether or not the variables in the model are stationary. Among the panel data unit root tests are Levin Lin Chu (Levin et al., 2002), Harris-Tsavalis (HT, 1999), Breitung (Breitung, 2000; Breitung and Das, 2005), Im Pesaran Shin (Im et al., 2003), augmented Dickey-Fuller (ADF) (Dickey and Fuller, 1979), and PP-Fisher x2 (Phillips and Perron, 1988), and Hadri (Hadri, 2000). The tests are testing the null hypothesis of the unit roots (or stationary) in the panel data sets.

After confirming that all the variables are stationary, the threshold autoregressive model developed by Hansen (1999) is estimated. The panel threshold autoregressive model was developed by Hansen (1999) based on the static framework. This study uses the static threshold model for the TCS as follows:

$$SGR_{i,t} = \begin{cases} \mu_i + \theta' h_{i,t} + \beta_1 CS_{i,t} + \varepsilon_{i,t} & \text{if } CS_{i,t} \leq y \\ \mu_i + \theta' h_{i,t} + \beta_2 CS_{i,t} + \varepsilon_{i,t} & \text{if } CS_{i,t} > y \end{cases} \quad (37)$$

$$\theta = (\theta_1, \theta_2, \theta_3, \theta_4)'$$

$$h_{i,t} = (DPR_{i,t}, NPM_{i,t}, ATS_{i,t}, SIZE_{i,t})'$$

Where, $SGR_{i,t}$ is the sustainable growth rate of a firm and $CS_{i,t}$ is the capital structure (known as the Lev 1(TDTE), Lev 2(TDTA), and Lev 3(TCDTA)), which is the explanatory variable and also the threshold variable. There are four control variables, h_{it} , namely, dividend payout ratio ($DPR_{i,t}$) and represents dividend policy, net profit margin ($NPM_{i,t}$) and represents profitability, assets to sales ($ATS_{i,t}$) and represents company efficiency, and natural log of total assets ($SIZE_{i,t}$) and represents firm size, which may affect the SGR. θ_1 , θ_2 , θ_3 and θ_4 represent the coefficient estimates of the control variables and μ_i is the fixed effect that represents the heterogeneity of firms under different operating conditions. β_1 and β_2 are the threshold coefficients where β_1 is the threshold coefficient when the threshold value is lower than y and β_2 is the threshold coefficient when the threshold value is higher than y . Moreover, i represents different firms and t represents different periods. The error, $\varepsilon_{i,t}$ is assumed to be independent and identically distributed with mean zero and finite variance, σ^2 .

In order to test the asymptotic distribution of the threshold estimate, the likelihood ratio statistics test can be utilised (Hansen, 1999). In addition to that, the estimators of the threshold value and the residual variance (\hat{y} and $\hat{\sigma}^2$, respectively) can be obtained by using the two-stage ordinary least squares (OLS) method and minimising the sum of squares of errors, $S_{1(g)}$. The null hypothesis of no threshold effect can be tested as, $H_0 = \beta_1 = \beta_2$ by using the likelihood ratio test; $F_1 = (S_0 - S_1\hat{y})/\hat{\sigma}^2$, where, S_0 and $S_1\hat{y}$ are

the sum of the squared error for the null hypothesis and the alternative hypothesis, respectively. Since F_1 has non-standard distribution, the bootstrap procedure can construct asymptotically valid p-values and critical values (Hansen, 1996). Therefore, the null hypothesis, $H_0 = \gamma = \gamma_0$ for the asymptotic distribution of the threshold estimate is tested using the likelihood ratio statistics test for $LR_1(\gamma) = [S_1(\gamma) - S_1(\hat{\gamma})]/\hat{\sigma}^2$. The asymptotic confidence interval is as follows: $c(\beta) = -2\log(1 - \sqrt{1 - \beta})$, where for a given asymptotic level β , the null hypothesis of $\gamma = \gamma_0$ will be rejected if $LR_1(\gamma)$ exceeds $c(\beta)$.

In addition, if double thresholds exist, the model will be modified as follows:

$$SGR_{i,t} = \begin{cases} \mu_i + \theta' h_{i,t} + \beta_1 CS_{i,t} + \varepsilon_{i,t} & \text{if } CS_{i,t} \leq \gamma_1 \\ \mu_i + \theta' h_{i,t} + \beta_2 CS_{i,t} + \varepsilon_{i,t} & \text{if } \gamma_1 < CS_{i,t} \leq \gamma_2 \\ \mu_i + \theta' h_{i,t} + \beta_3 CS_{i,t} + \varepsilon_{i,t} & \text{if } \gamma_2 < CS_{i,t} \end{cases} \quad (37)$$

Where, the threshold value is $\gamma_1 < \gamma_2$. The model can be extended to multiple thresholds using the same process $(\gamma_1, \gamma_2, \gamma_3, \dots, \gamma_n)$.

3.8 Conclusion

This chapter described the research methodology by discussing the sample, measurement of each variable, and the methods to answer the research questions and to find out from where and how the data were collected and analysed. The study used the quantitative methodology by means of the secondary data. The following chapter provides a discussion on the empirical results of objective one on the TCS and TDP, and objective two, which examines the the mediating effect of SGR on the relationship between firm specific factors (capital structure, dividend policy, profitability, company efficiency and firm size) and SPP. Empirical study on objective three discusses the threshold analysis, followed by a discussion on the recommendations and implications.