THE IMPACT OF CLIMATE CHANGE AND FIRM CHARACTERISTICS ON THE FINANCIAL PERFORMANCE OF AGRO FIRM: STUDY ON MALAYSIAN PUBLIC LISTED COMPANIES

By

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Abstract

The aim this study is to examine the impacts of climate change and firm characteristics on Malaysian agro firm performance. The sample of this study consists of 33 Malaysian public listed plantation firms with 462 firm year observations for the period of 2003 to 2016. Panel data regressions such as the pooled OLS, fixed effect and random effect model are used to analyse the dataset. Based on the regression results, growth opportunity, rainfall and El Nino positively and significantly impact ROA, whereby leverage, liquidity, temperature and flood negatively and significantly impact ROA. Another measure of firm performance which is ROE are positively and significantly influenced by liquidity, growth opportunity and El Nino. However, temperature and flood negatively and significantly impact ROE. At the same time, leverage, temperature and flood positively and significantly foster Tobin's Q where firm size negatively and significantly impacts Tobin's Q. Overall, all variables are significant with firm performance accept firm age is found to be insignificant in influencing Malaysian agro firm performance.

Keywords: Climate change, Agro firm, Return on assets (ROA), Return on equity (ROE), Tobin's Q,

Abstrak

Tujuan kajian ini adalah untuk mengkaji kesan perubahan iklim dan ciri-ciri firma pada prestasi firma agro Malaysia. Sampel kajian ini terdiri daripada 33 syarikat perladangan tersenarai awam Malaysia dengan 462 firma tahun pemerhatian untuk tempoh 2003 hingga 2016. Regresi data panel seperti pooled OLS, fixed effect dan random effect digunakan untuk menganalisis dataset. Berdasarkan hasil regresi, peluang pertumbuhan, hujan dan El Nino memberi kesan positif dan signifikan terhadap ROA, di mana tanggungan, kecairan, suhu dan banjir memberi impak yang negatif dan signifikan terhadap ROA. Satu lagi ukuran prestasi firma yang ROE adalah positif dan ketara dipengaruhi oleh kecairan, peluang pertumbuhan dan El Nino. Walau bagaimanapun, suhu dan banjir memberi impak yang negatif dan nyata kepada ROE. Pada masa yang sama, tanggungan, suhu dan banjir secara positif dan menimbulkan ketara Tobin's Q di mana saiz firma secara negatif dan memberi impak yang signifikan terhadap Tobin's Q. Secara keseluruhannya, semua pembolehubah adalah penting dengan prestasi firma yang menerima usia firma didapati tidak penting dalam mempengaruhi prestasi firma agro Malaysia.

Kata Kunci: Perubahan iklim, Firma agro, Pulangan atas aset (ROA), Pulangan atas ekuiti (ROE), Tobin’s Q,

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List of Abbreviation

ASEAN	Association of Southeast Asian Nations
BRIC	Brazil, Russia, India and China
CRSP	The Center for Research in Security Prices
ENSO	El Niño Southern Oscillation
GDP	Gross domestic product
LM	Lagrangian Multiplier
OLS	Ordinary Least Squares
Prob	Probability
ROA	Return on assets
ROE	Return on equity
S&P	Standard and Poor
UK	United Kingdom

CHAPTER ONE

INTRODUCTION

1.1 Introduction

This chapter explains the area of the study along with Malaysian economic outlook, problem statement, research questions, significance and scope of the study.

1.2 Background of the Study

Firm performance is a process of measuring firm's overall financial health. Financial performance is firm's operational capability to manage resources in many ways to gain competitive advantage over other firms (Iswatia & Anshoria, 2007). According to Haniffa and Hudaib (2006) firm performance is apparently reflected by conduct and systems through which the organizations are overseen and the effectiveness of the governance body of the organizations. Profitability is defined as proxy of financial performance (Burca & Batrinca, 2014). To make profit is an essential part for the company to compete with other organizations and attract investors in global market. Additionally, the ultimate goal of firm manager is to maximize shareholder wealth. Moreover, Firm Financial analyst analyzes firm's performance which helps in the process of decision making on operating, financing, and investing activities. If firm fails to generate profit, it will face difficulties in operating its business, eventually firm would become insolvent. Therefore, financial performance is important for business in order to become self-sustaining and create value to the shareholders.

Firm performance might be affected by different factors. Climate change could be one of the reason that impacts firm performance. Climate is the statistics of weather over the long period of time which is measured by assessing the amount of precipitation, temperature, relative humidity, flood and drought (Alam, Taufique & Sayal, 2017). The climate has been changing over the time but recently it is changing rapidly. For example, the world annual average temperature was 0.70 degree Celsius more at the end of twentieth century than those recorded at the end of nineteen century (Kalra et al., 2007). Perfect temperature and rainfall ensure the growth of crops which increases the yield but recent climate change factors such as flood and drought destruct the crops and reduce agriculture production (Ibrahim & Alam, 2016). Therefore, climate change considers to be an important factor of affecting firm performance.

Firm performance is primarily measured based on accounting based measures and market based measures. For instance, accounting based measures are return on assets (ROA), return on equity (ROE), net profit margin (NPM) and gross profit margin (GPM). Return on assets (ROA) and return on equity (ROE), however, are mostly used as accounting based measures of performance (Heffernan & Fu, 2010; Hoque, Islam & Azam, 2013; Liu, Miletkov, Wei & Yang, 2015; Ongore & Kusa, 2013). And, market based measures are earning per share (EPS), Tobin's Q, and price earnings ratio (P/E ratio). Among them Tobin's Q is widely used to measure firm performance (Bae, Kim & Oh, 2016; Ducassy & Guyot 2017; Laeven & Levine, 2008).

1.2.1 Malaysian Economic Outlook

Since few decades, Malaysia has been experiencing strong economic growth. Even though, Malaysian economy collapsed during Asian financial crisis in the years 1997-1998, managed to rebuild its economy quickly. For instance, average GDP growth rate from the year 2000 to 2008 was 5.50 percent. In line with, GDP growth rate continued to increase after global financial crisis 2008-2009 such as average GDP growth rate continue as 5.7 percent from 2010 till 2016.

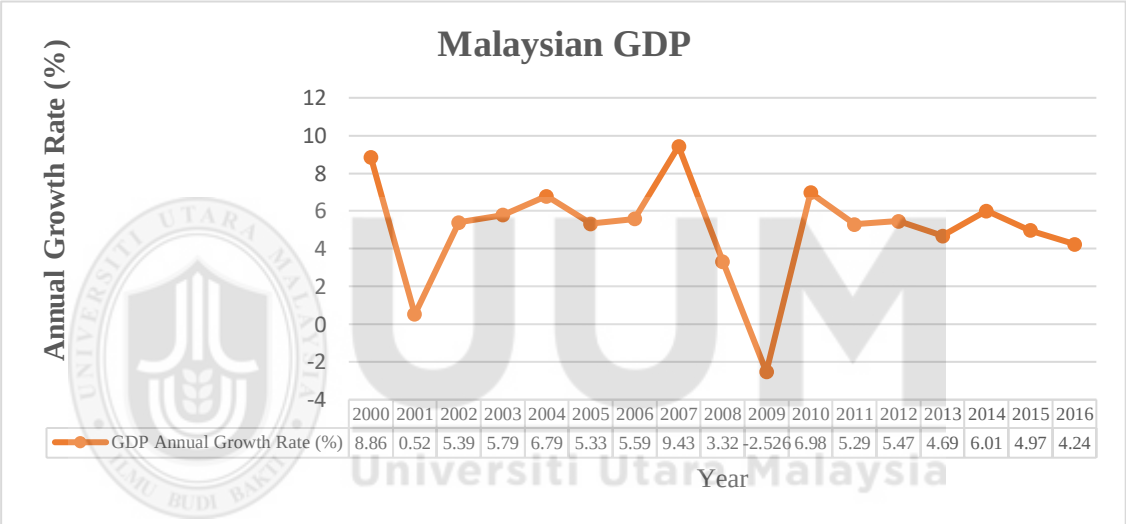

Figure 1.1
Malaysian GDP from 2000 to 2016
Source: The World Bank

Figure 1.1 shows that Malaysian GDP reached the highest level (9.43 percent) in 2007 and the lowest (Negative 2.53 percent) in 2009. Unstable politics, devaluation of Malaysian currency and decrease in revenue from export goods lead to decline GDP from 6.01 percent in 2014 to 4.97 in 2015. It continued to decline to 4.24 percent in 2016.

However, International Monetary Fund (2017) reported that real GDP growth rate expected to increase from 4.2 percent in 2016 to 4.5 percent in 2017. In addition, Malaysian economic outlook proved favorable with economic growth by expanding in the first quarter of 2017. Economic growth of first quarter of 2017 indicates that economic condition is improving, and growth rate projected to increase to 4.9 percent from current estimated range of 4.3 to 4.8 percent (The World Bank, 2017). GDP growth were higher e.g. first quarter growth rate 5.6 percent and second quarter was 5.8 percent in 2017 (Department of Statistics Malaysia, 2017) than expected 4.5 percent and 4.9 percent (International Monetary Fund, 2017; The World Bank, 2017).

1.2.2 Malaysian Agriculture Sector

Agriculture sector is an important sector of Malaysian economic transformation program. Key crops in agriculture sector are Palm oil, Rubber, Paddy and Cocoa. Especially, palm oil and rubber are the main two products that always contributed to the GDP growth rate. Malaysia generates more revenues from exporting palm oil and rubber to other countries.

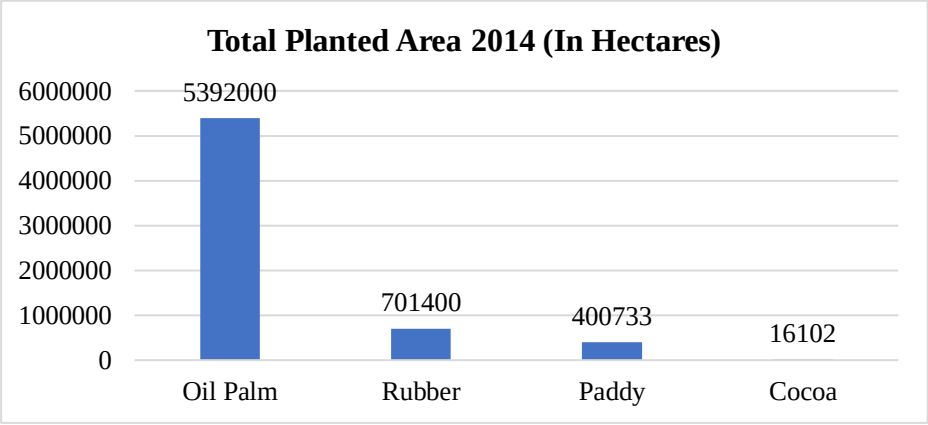

Figure 1.2
Total Planted Area in 2014
Source: Department of Statistics Malaysia

Figure 1.2 illustrates the amount of area that used for planting crops. 5,392,000 hectares land has been used for planting palm oil. Other than that, 701,400 hectares land has been used for rubber plantation, 400,733 hectares for paddy plantation and 16,102 hectares for cocoa plantation. Hence, Malaysia is utilizing more land for palm oil plantation.

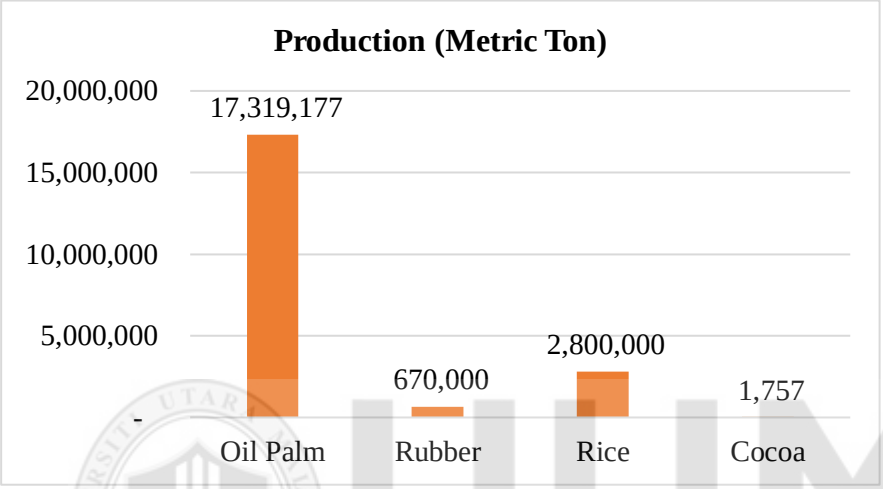

Figure 1.3
Total Production in 2016
Source: Department of Statistics Malaysia and Malaysian Cocoa Board

Figure 1.3 illustrates the amount of productions of palm oil, rubber, paddy and cocoa. Palm oil production is highest of 17,319,177 metric ton and cocoa production is lowest of 1,757 metric ton among other crops.

Table 1.1
GDP contribution by Agriculture Sector from 2010 to 2016

Year	Contribution to the GDP (in Billion)	Change
2010	82.89	
2011	88.56	6.8%
2012	89.41	1.0%
2013	91.18	2.0%
2014	93.05	2.1%
2015	94.14	1.2%
2016	93.58	-0.6%

Source: Bank Negara Malaysia and Department of Statistics Malaysia

Table 1.1 shows the agriculture sector contribution to the GDP in absolute amount. It clearly illustrates that agriculture sector's contribution to the GDP has increased apart from in the year 2016. The amount of sharing to the GDP increased by 6.8% in 2011. In addition, the level of total contribution in absolute amount to GDP increased from 2010 till 2015 which was RM 94.14 billion. Agriculture sector contributes RM 93.58 billion to the GDP in 2016.

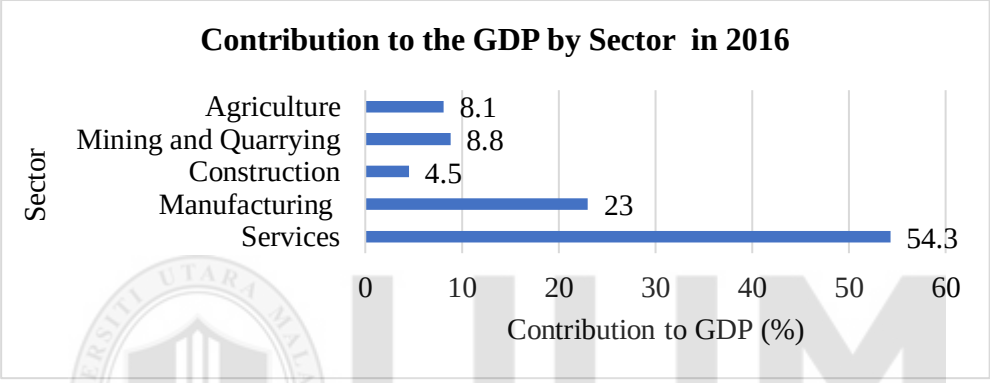

Figure 1.4
Percentage Share to GDP 2016 (Exclude import duties)
Source: Department of Statistics Malaysia

Figure 1.4 shows the amount of contribution to the GDP by different sectors like services, manufacturing, mining and quarrying, agriculture and construction in 2016. Although services sector contributes 54.3 percent of total GDP of 1108.2 billion, but agriculture sector also an important part of national economy. Agriculture sector contributes 8.1 percent to the GDP in 2016. Besides, this sector creates a massive job opportunity for people. More than 1.6 million people are involved with agriculture sector in 2015 which represents 11.7 percent of total workforce in Malaysia (Department of Statistics Malaysia, 2016).

1.3 Problem Statement

Drought is the main threat of crops; and El Nino event causes drought and other flash floods or hurricanes those disrupt agricultural activities and damage crops. Although, El Nino Southern Oscillation (ENSO) is a climate event that originated in the Pacific Ocean, it impacts global weather and it is associated with droughts and floods (Kovats et al., 2003). El Nino is a recurrent weather phenomenon that takes place approximately every two to eight years and remain for twelve to eighteen months (Kovats et al., 2003; Moy, Seltzer, Rodbell & Anderson, 2002). In Malaysia, increasing in seasonal temperature related to El Nino 2015-2016 caused in declining agricultural production. The impact of declining production in agricultural sector reduces the level of sharing amount from RM 94.14 billion in 2015 to RM 93.58 billion in 2016.

Hence, climate change such as flood, temperature, rainfall and droughts reduce land and water regimes which adversely affect agricultural productivity (Kurukulasuriya & Rosenthal, 2003). Some crops are concentrated in one specific region whereas others are grown globally. Globalization of markets and trade should diminish the impact of any region-specific declining output. Commodity prices changes are likely to be local rather than global because global markets are well supplied (World Bank, 2015). Therefore, to understand the actual impacts of climate change, regional study is important.

Previously, most of the researches have been conducted on the impact of climate change and found that climate change affects agricultural production and crop yield (e.g., Aydinalp & Cresser, 2008; Bosello & Zhang, 2005; Collier, Conway & Venables, 2008; Hartel, Burke & Lobell, 2010; Rosenzweig et al., 2002). However, declining in crops

production would be one of the reason of declining firm's profitability but the direct impacts of climate change on agricultural firm's financial performance are not clearly known or else findings of other studies might not applicable in Malaysian context.

1.4 Research Questions

Based on the problems, the study considers the following questions.

1. What are the impacts of climate change such as temperature, rainfall, El Nino and flood on Malaysian agro firm financial performance?
2. What are the relationship between firm characteristics such as leverage, firm size, firm age, liquidity, growth opportunity and firm performance?

1.5 Research Objectives

The overall purpose of this study is to examine the impact of climate change and firm characteristics on Malaysian agro firm financial performance.

The following specific objectives will answer the above questions

1. To examine the impacts of climate change such as temperature, rainfall, El Nino and flood on Malaysian agro firm financial performance.
2. To investigate what are the relationship between firm characteristics such as leverage, firm size, firm age, liquidity, growth opportunity and firm performance.

1.6 Significance of the Study

This research will reveal new knowledge about the impacts of climate change on financial performance of agro-based companies. Besides that, this study will provide clarification on the factors that may influence agricultural firm performance. Therefore, the agro firm may rectify the problems related to the financial performance. At the same time, this study will contribute to the literature especially from the context of Malaysian agriculture firms and provides empirical evidence on the impacts of climate change on related firm financial performance.

1.7 Scope of the Study

This study is solely conducted on Malaysian listed plantation firms those are also considered as agricultural firms. Secondary data is used to examine the impacts of climate change and firm characteristics on financial performance of Malaysian agriculture firms. Data collected from DataStream, Bursa Malaysia, The World Bank database, Climate Prediction Center USA and Department of Statistics Malaysia. 43 companies are enlisted under plantations sector in Bursa Malaysia till 2017. Based on availability of data, this study used a sample of 33 plantation firms from 2003 to 2016. Many factors may affect agro firm performance as identified by the previous research, but this study has considered most relevant factors such as leverage, firm size, firm age, liquidity, growth opportunity, temperature, rainfall, El Nino and flood. Due to the time constrain, this study only focused on Malaysian agro firms.

1.8 Organization of the Study

This study is divided into five chapters. Chapter one is introduction mainly consists of background of the study, problem statement, research questions, research objectives, significance and scope of the study. Second chapter is literature review related with the research topic. This chapter provides empirical evidence of the study. Third chapter is methodology. This chapter represents sample size, data collection method, research framework, hypothesis of the study, variables measurement and method of data analysis. Chapter four is results and discussion. This chapter describes statistical analysis and findings of the study. The final chapter is conclusion and recommendation which presents the conclusion and provides recommendation for further research.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter mainly discusses about the relevant literature related to the variables of the study. The purpose of this chapter is to give empirical evidence of factors affecting firm's performance.

2.2 Empirical Evidence

Previous studies used many variables to determine factors affecting firm's performance. This study considers most relevant predictor variables, such as leverage, firm size, firm age, liquidity, growth opportunity, temperature, rainfall, El Nino and flood to examine the impacts of climate change on firm performance measured by Return on Assets (ROA), Return on Equity (ROE) and Tobin's Q.

2.2.1 Leverage and Firm Performance

Firms finance their activities through issuing debt and equity (Roy, 2016). He further added that, even though firms likely to use more debt because of interest on debt is tax deductible but uses of debt might affect firm performance. In a sense, Higher level of debt might be risky for the firm which also can lead the firm to bankruptcy at the time when firm unable to meet with its financial obligations. However, Ahmad, Abdullah and Roslan (2012) argued that the level of debt used by the firm does not affect firm's performance. Therefore, mixed findings exist in previous studies on leverage and firm performance.

Leverage and Return on Assets

Clifford and Lindsey (2016) conducted study on S&P 1500 firms from 1996 to 2005. They found a positive and significant relationship between leverage and ROA. This finding supported by Davydov (2016) who applied data of 700 publicly traded firms from BRIC countries and highlighted that leverage is positive and significantly allied with ROA.

In contrast, Burca and Batrinca (2014) conducted study with the aim of analyzing the determinants of the financial performance of Romanian insurance company. They employed 105 observations and used panel data from 2008 to 2012. They found that leverage is negatively associated with ROA. The negative result shows that firm which finances its activities through leverage rather than issuing equity result an increase in browning and caused bankruptcy risk in the event of unexpected losses which caused reduction in firm's performance. In addition, Similar result found by Anderson and Reeb (2003), they studied on S&P 500 firms during the period from 1992 through 1999 and stated that leverage significantly affected ROA with negative sign. There are several scholars also highlighted negative influence of leverage on ROA (e.g., Chang & Boontham, 2017; Lim, Wang & Zeng, 2017; Nguyen & Nguyen, 2015).

However, Chaudhuri, Kumbhakar and Sundaram (2016) conducted study on all listed firms in India where leverage is not significant determinate of firm performance measured by ROA. Some other studies, such as, Ekholm and Maury (2014), Heffernan and Fu (2010) and Muhamed, Stratling and Salama (2014) who also found that there is no significant linked between Leverage and ROA.

Leverage and Return on Equity

Kwong (2016) employed a sample of 680 Malaysian non-financial firms during the period of 2003 to 2012 and reported positive and significant relationship between leverage and ROE. It indicates that firms with higher leverage will generate more profit. This finding is supported by Castro, Arino and Canela (2010). They used panel data of 658 US firms from 1991 to 2005 and found that leverage significantly affected firm's performance where leverage is positively associated with ROE. In addition, employing 100 Sri Lankan listed firms over the period of 2010 till 2012, Azeez (2015) examined the relationship between corporate governance and firm performance and found positive and significant relationship between two variables which are leverage and ROE. Besides that, Elyasiani and Zhang (2015) correspondingly found that leverage and ROE positively associated.

However, many researchers reported that there is negative relationship between leverage and ROE. Roy (2016) studied on Indian listed firms over the period of 2007-2008 to 2011-2012 and found negative and significant relationship between leverage and ROE. Negative relationship between leverage and ROE suggests that increase in leverage tend to decrease in firm's profitability and vice versa. Similar result found by Mirza and Javed (2013) examined determinates of financial performance of listed 60 Pakistani corporate firms form the period of 2007 to 2011 and found that leverage is negatively associated with ROE. In addition, Sami, Wang and Zhou (2011) got the same result where leverage and ROE are negatively related in China firms. Moreover, Liu et al. (2015), Nguyen and Nguyen (2015), Siddik, Kabiraj and Joghee (2017) and Yu (2013) who also identified negative and significant relationship between leverage and ROE.

On the other hand, number of studies have not found any significant relationship between leverage and ROE (e.g., Heffernan & Fu, 2010; Muhamed et al., 2014; Zouari & Taktak, 2014).

Leverage and Tobin's Q

Elyasiani and Zhang (2015) found an evidence that leverage is significant and positively associated with Tobin's Q using a sample of 116 bank holding companies between 2001 and 2010. Same evidence also found by Castro et al. (2010) and Davydov (2016) who reported significant and positive relation between leverage and Tobin's Q.

In contrast, Ekholm and Maury (2014) used FCSD data consist of 132 Finnish listed firms during the period of 1996 to 2006. They discovered that leverage is significant and negatively associated with Tobin's Q used as a measurement of financial performance. This finding likewise associated with the finding of Adams, Almeida and Ferreira (2005). They studied on 336 US firms during the period of 1992 to 1999 and highlighted that leverage significantly influences firm performance as measured by Tobin's Q with negative sign. Furthermore, Anderson and Reeb (2003), Bae et al. (2017), Chi and Su (2017) and Frijns, Dodd and Cimerova (2016) similarly found that leverage is negative and significantly allied with Tobin's Q.

Yet, few researches confirm that leverage is not significantly associated with Tobin's Q (e.g., Ducassy & Guyot, 2017; Kwong, 2016; Laeven & Levine, 2008; Muhamed et al., 2014).

2.2.2 Firm Size and Firm Performance

Firm size is an important factor of firm's profitability. Basically, large firms are more diversified, utilize advance technology and well overseen, therefore, the impact of firm size is positive and probably boost firm performance (Margaritis & Psillaki, 2010). On the other hand, small firms are more concern about shareholders wealth (Besser, 1999). Thus, small firm likely to avoid risky investment and utilize its assets wisely. Earlier studies reported mix findings between firm size and firm performance.

Firm Size and Return on Assets

Lewandowski (2017) used a sample comprises a panel data set that consists of 1640 companies over the period of 2003 to 2015. They discovered a positive and significant effect of firm size on ROA. in addition, firm size has positive linkage with ROA because big firms are well risk diversified, better in expenses management, and have complex information system (Burca & Batrinca, 2014). Furthermore, Clifford and Lindsey (2016), Daher and Saout (2015), Hudaib and Haniffa (2006), Lim, Wang and Zeng (2017), Nguyen and Nguyen (2015) and Nimtrakoon (2015) among others, also found a positive and significant relationship between firm size and ROA.

On the other hand, using top 150 listed Taiwan's company over the period of 2003 to 2014, a negative impact of firm size on ROA found by Weng and Chen (2017). His study supported by another study conducted by Upadhyay, Bhargava, Faircloth and Zeng (2017). They employed a sample consists of 1,737 large US firms from 1996 to 2005, and found an evidence that firm size is significant and negatively related with ROA. In addition, some researchers also determined firm size is negatively influences ROA (e.g., Hoque et al., 2013; Liang, Ching & Chan, 2013; Rachdi, 2013).

Nevertheless, few researchers (e.g., Castro et al., 2010; Ekholm & Maury, 2014; Gong, Louis & Sun, 2008) have not shown any significant relationship between firm size and ROA.

Firm Size and Return on Equity

Utilizing a panel data set that consists of 22 Bangladeshi banks over 9 years period of study from 2005 to 2014, Siddik et al. (2017) examined the link of capital structure and bank firm performance and found a positive relationship between firm size and ROE. They suggested that to have better performance, firm should be bigger in size. This finding is similar with the finding of Mirza and Javed (2013) reported positive and significant relationship between firm size and ROE. Number of prominent researchers, such as Castro et al. (2010), Liu et al. (2015) and Nguyen and Nguyen (2015), among others, also reported that firm size is positive and significantly associated with ROE.

Alternatively, Liang et al. (2013) employed a sample comprises of 45 European banks during the year of 2000 to 2007 and identified that firm size is negative and significantly related with ROE. This result is supported by Rachdi (2013) who also discovered negative relationship between firm size and ROE. Likewise, Elyasiani and Zhang (2015), Kwong (2016) and Roy (2016) confirmed that firm size is negative and significantly associated with ROE.

Nevertheless, Muhamed et al. (2014) studied on listed Malaysian government link company during the period from 2004 to 2008 and they found insignificant relationship between firm size and ROE. Besides that, Azeez (2015) and Hoque et al. (2013) have not found any significant connection between firm size and ROE.

Firm Size and Tobin's Q

Numerous studies were carried out in developed countries as well as in developing countries regarding to the relationship between firm size and Tobin's Q. Adams et al. (2005), Balsam, Puthenpurackal and Upadhyay (2016), Frijns et al. (2016) and Upadhyay, Bhargava, Faircloth and Zeng (2017) conducted researches in developed countries and reported positive and significant relationship between firm size and Tobin's Q. Likewise, firm size is also positive and significantly associated with Tobin's Q in developing countries (Kwong, 2016; Nguyen & Nguyen 2015).

Contrary, applying Standard and Poor COMPUSTAT and CRSP databases sample consists of 14,887 firm-year observation with 1,481 firms spanning from 1970 to 2011, Bae et al. (2017) discovered a negative relationship between firm size and Tobin's Q in developed country. This finding is similar with the finding of Hudaib and Haniffa (2006) who also reported that firm size is negatively related with Tobin's Q in developing country. Among other researchers, Anderson and Reeb (2003), Chi and Su (2017) and Lim et al. (2017) found that firm size negatively and significantly influences firm performance, as measured by Tobin's Q.

However, few scholars found the evidence wherein firm size is not significant factor in influencing firm performance measured by Tobin's Q (e.g., Castro et al., 2010; Ekholm & Maury, 2014; Laeven & Levine, 2008; Muhamed et al., 2014).

2.2.3 Firm Age and Firm Performance

Firm age is defined as the number of years since the firm is incorporated in the market (Anderson & Reeb, 2003; Ekholm & Maury, 2014). Firm age may positively impact firm's profitability as older firms have more operational experience can cut down unnecessary expenses than younger firms do (Coad, Daunfeldt & Halvarsson, 2014). Contrary, the older firms capture the lesser value compare to younger firms from entrepreneurial strategies when the firms in higher growth rates (Anderson & Eshima, 2013). Hence, profitability apparently to decline as firms get older (Loderer & Waelchli, 2010). Furthermore, many scholars conducted study in different countries and firm age found to be an important factor in influencing firm performance.

Firm Age and Return on Assets

Employing sample consists of 39,601 public and 6,164 private firm year observation from 2001 to 2011 in USA, Gao, Harford and Li (2017) discovered significant and positive linkage between firm age and ROA. This study supported by Ko, Tong, Zhang and Zheng (2016) who also reported that firm age is positive and significantly impact ROA in Pacific Basin countries.

However, Chang and Boontham (2017) studied on 118 firms from 10 Asian emerging economies and found that firm age is significant and negatively associated with ROA. Furthermore, other scholars for example, Anderson & Reeb (2003), Balsam et al. (2016), Chaudhuri, Kumbhakar and Sundaram (2016), Liu et al. (2015), Upadhyay et al. (2017) and Weng and Chen (2017) also reported significant positive relationship between firm age and firm size.

Nevertheless, few researchers found insignificant relationship between firm age and ROA (e.g., Adams et al., 2005; Azeez, 2015; Ekholm & Maury, 2014; Lim et al., 2017).

Firm Age and Return on Equity

Weng and Chen (2017) identified that firm age is significant and positively influence firm performance, as measured by ROE. This finding is consistence with the finding of Zouari and Taktak (2014), they also reported positive and significant relationship between firm age and ROE.

Contradict result was reported by Liu et al. (2015), they found significant negative relationship between firm size and ROE.

Nevertheless, Azeez (2015) and Roy (2016) have not found any significant relationship between firm age and ROE.

Firm Age and Tobin's Q

Ekholm and Maury (2014) highlighted that firm age is significant and positively impact Tobin's Q. Where, Anderson and Reeb (2003), Chi and Su (2017), Frijns et al. (2016), Kale, Reis and Venkateswaran (2009) and Upadhyay et al. (2017) confirmed that relationship between firm age and Tobin's Q negative and significant.

However, some scholars, such as Balsam et al. (2016), Bae et al. (2017) and Lim et al. (2017) have not found any significant relationship between firm age and Tobin's Q.

2.2.4 Liquidity and Firm Performance

Liquidity is defined as the firm's ability to fulfill its short-term obligations. During absence of information in the capital market, liquidity is considered as availability of internal fund and an important factor of investment (Hoshi, Kashyap & Scharfstein, 1991). Besides, Liquidity is concerned itself with the allocation of how much wealth should be in hand and invested in alternative financial assets (Tobin, 1958). Thus, firm's liquidity level might be an important determinant of firm performance.

Liquidity and Return on Assets

Employing a sample comprises of large Tunisian commercial banks over the period before 2000-2006 and during 2007-2010 international financial crisis, Rachdi (2013) identified significant and positive relationship between liquidity and ROA. This result is consistence with Rahman, Hamid and Khan (2015) investigated determinates of bank profitability. They studied on 25 commercial banks from Bangladesh from 2006 to 2013 and reported positive and significant relationship exist in between liquidity and firm performance as measured by ROA. This result indicates that firms with high level of liquidity generate more profit.

Davydov (2016) argued that liquidity is negatively associated with ROA. Author examined the effect of public and bank debt financing on firm performance. This study used a sample of 700 publicly traded firms in BRIC countries from the period of 2003 to 2012. This result is supported by Adams and Buckle (2003) who found a significant and negative relationship between Liquidity and ROA.

However, number of prominent scholars, for example, Heffernan and Fu (2010), Hoque et al. (2013), Liang et al. (2013), Muhamedet al. (2014), and Ongore and Kusa (2013), concluded that liquidity doesn't significantly influence ROA.

Liquidity and Return on Equity

Heffernan and Fu (2010) employed a sample consists of 76 Chinese banks with the aim to test the factors influencing banks performance between 1999 and 2006. Authors found that liquidity is significant and positively related with ROE in china banking sector. Their evidence supported by other studies those discovered a positive and significant relationship between liquidity and ROE (Rachdi, 2013; Rahman et al., 2015).

Contrary, Mirza and Javed (2013) identified that liquidity negatively and significantly fosters ROE. They argued that high liquidity means firm holding too much cash on hand that could make more money if it was invested properly. This argument supported by the research conducted by Gurbuz, Aybars and Kutlu (2010).

Yet, few scholars, for example, Hoque et al. (2013), Muhamed et al. (2014), Siddik et al. (2017) and Ongore and Kusa (2013) identified insignificant relationship between liquidity and ROE.

Liquidity and Tobin's Q

No significant result found in between liquidity and Tobin's Q (Davydov, 2016; Liang et al., 2013; Muhamed et al., 2014).

2.2.5 Growth Opportunity and Firm Performance

High growth firms are more profitable; therefore, it attracts investors, gain investors trust those enable managers to increase firm capital (Hermuningsih, 2013). Author farther added, highly growth firms likely to use their internal fund to minimize cost. Thus, firms generate more profit and increase return on equity and firms value as well.

Growth Opportunity and Return on Assets

With the aim of examining the impact of cultural diversity in boards of directors on firm performance, Frijns et al. (2016) used a sample of 243 UK firms from the period of 2002 to 2014 and discovered positive and significant relationship between growth opportunity and ROA. This study is identical with the study of Nguyen and Nguyen (2015) who also reported that growth opportunity significantly influences ROA with positive sign. Davydov (2016), Lewandowski (2017) and Liu et al. (2015) reported positive relationship between growth opportunity and ROA as well.

However, Lim et al. (2017) argued that there is no significant relationship between growth opportunity and ROA.

Growth Opportunity and Return on Equity

Lewandowski (2017) studied on corporate carbon and financial performance. This scholar used sample that consists of 1640 international firms for the period of 2003 to 2015 and identified significant and positive linkage between growth opportunity and ROE. This finding is identical with the finding of Liu et al. (2015) and Nguyen and Nguyen (2015).

On the other hand, a few scholars for example Mirza and Javed (2013) concluded that growth opportunity is not a significant factor of firm performance measured by ROE.

Growth Opportunity and Tobin's Q

Using CRSP and COMPUSTAT data of 10,714 unique firms from the period of 1991 to 2012, Chi and Su (2017) found significant and positive relationship between growth opportunity and Tobin's Q. In addition, other researchers also identified that growth opportunity is positively related with Tobin's Q (e.g., Cui & Mak, 2002; Ducassy & Guyot 2017; Frijns et al., 2016; King & Santor, 2008; Maury, 2006).

Contrary, Laeven and Levine (2008) and Lim et al. (2017) claimed that growth opportunity significantly and negatively influences firm performance measured by Tobin's Q.

However, Davydov (2016) Nguyen and Nguyen (2015) found insignificant relationship between growth opportunity and Tobin's Q.

2.2.6 Temperature and Firm Performance

Crops yield reduction is associated with increase in temperature. Wheat, barley, gram and mustard production yield declined in northern region of India due to increase in seasonal temperature (Kalra et al., 2007). Author demonstrated that one degree increases in mean temperature caused grain yield decreased by 428 kilograms per hectare.

2.2.7 Rainfall and Firm Performance

Rainfall increases the moisture and water regime in soil which rises crop production. Munodawafa (2012) found that maize grain yield increased by 0.4 tons every 100 millimeters rainfall increment. Major crops yield increased in the high rainfall zone of southern Australia (Zhang, Turner, Poole & Simpson, 2006). Hence, rainfall is beneficial for agro-based firms. As a result, firm generates more profit. However, Foster and Rosenzweig (2004) found negative effects of rainfall on crops income in India.

2.2.8 El Nino and Firm Performance

El Nino Southern Oscillation (ENSO) is a climate event that originated in the Pacific Ocean, but it impacts global weather and it is associated with droughts and floods (Kovats et al., 2003). El Nino phenomenon is the most potential source of climatic variability (Berry & Kozaryn, 2008). El Nino could be a reason of less productivity in agro-based firm or declining in country's overall economic health. Cashin, Mohaddes and Raissi (2017) found that El Nino negatively impact on real economic activity in Australia, Brazil, Indonesia, Peru, Philippines, and South Africa, however, El Nino positively impact on real economic activity in Argentina, Canada, China, Chile, Europe, Singapore Thailand and USA.

2.2.9 Flood and Firm Performance

Flash flood can occur suddenly and caused for hazards such as landslides, damage to infrastructure, mud flows and even death (Collier, 2007). These hazards impact directly to the agricultural production and quality of the product consequently effect firm's performance. The flood in the Yangtze basin adversely affected crops production and

caused of damaging land and house as a result China faced huge economical losses (Piao et al., 2010).

2.3 Chapter Summary

This chapter discusses about firm performance which supported by literature. Empirical evidence shows mixed findings between predictor variable and explained variable. Some studies found positive significant and negative significant relationship whereby some other studies reported insignificant relationship between same independent variable and dependent variable.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter presents theoretical framework to examine the impact of leverage, firm size, firm age, liquidity, growth opportunity, temperature, rainfall, El Nino and flood on financial performance of Malaysian agro firm. Besides that, this chapter also discusses about the sample size, data collection method, variables measurement and methodology are used to analysis the panel data set.

3.2 Sample

In case of Bursa Malaysia, all agro and related firms are enlisted under plantations sector. So, this study works on the firms that are enlisted as plantation firms. This study primarily considered data for 20 years from 1997 to 2016. At the time of conducting this study, 43 companies registered under plantations sector in the main market of Bursa Malaysia. However, this study eliminated few companies from all listed firms under plantations sector and reduced the study period because of unavailability of data. Therefore, based on availability of data, this study considered 33 companies data for 14 years period from 2003 to 2016. Hence, final sample of this study consists of balanced panel data set of 33 plantation firms with 462 firm-year observations from 2003 to 2016. Table 3.1 shows the final sample list of agro and related firms are enlisted under plantations sector in Bursa Malaysia from 2003 to 2016.

Table 3.1
List of Plantation Companies

Malaysian Public Listed Plantation Companies	
1. Astral Asia Berhad	17. Kretam Holdings Bhd
2. Batu Kawan Berhad	18. Kuala Lumpur Kepong Bhd
3. Bld Plantation Bhd	19. Kwantas Corp Bhd
4. Cepatwawasan Grp Bhd	20. Malpac Holdings Bhd
5. Chin Teck Plantation	21. MHC Plantations Bhd
6. Dutaland Bhd	22. Negri Sembilan Oil Bhd
7. Far East Holdings Bhd	23. NPC Resources Bhd
8. Genting Plantations Bhd	24. Pinehill Pacific Bhd
9. Golden Land Berhad	25. PLS Plantations Bhd
10. Gopeng Berhad	26. Riverview Rubber Bhd
11. IJM Plantations Bhd	27. Sarawak Oil Palms Bhd
12. Inch Kenneth Kajang Bhd	28. Sin Heng Chan Malaysia Bhd
13. Innoprise Plantation Bhd	29. Sungei Bagan Rubber Bhd
14. IOI Corporation Bhd	30. TDM Berhad
15. Kim Loong Resources Bhd	31. TSH Resources Berhad
16. Kluang Rubber Company Malaya Bhd	32. United Malacca Bhd and
	33. United Plantations Bhd.

3.3 Data Collection

This study used secondary data collected from various reliable sources. Company's historical financial data collected from DataStream and Bursa Malaysia. Besides that, annual mean temperature and annual mean rainfall data collected from The World Bank data base. In addition, information regarding El Nino event gathered from Climate Prediction Center, USA and information regarding flood collected from Wikipedia. Furthermore, previous thesis, journals, articles, research papers, case studies and other related sources were used as sources of relevant information.

3.4 Variables and Measurement

This section covers dependent variable and independent variables and their measurements.

3.4.1 Dependent Variable

Dependent variable is the primary interest of research. Firm performance is the dependent variable. Based on literature, firm performance measured using accounting based measurement and market based measurement. Accounting based measures such as return on assets (ROA) and return on equity (ROE), and market based measure such as Tobin's Q are used as a proxy of measuring firm performance.

3.4.1.1 Return on Assets

Return on assets is an indicator of firm's profitability related to its total assets and firm's capability in assets utilization (Nimtrakoon, 2015). Previously, many scholars used ROA as a proxy of firm performance (Burca & Batrinca, 2014; Chang & Boontham, 2017; Ekholm & Maury, 2014). Return on assets is calculated as operating income divided by book value of total assets (Davydov, 2016; Frijns et al., 2016; Nimtrakoon, 2015).

$$\text{ROA} = \frac{\text{Operating Income}}{\text{Book value of Total Assets}}$$

3.4.1.1 Return on Equity

ROE refers how much profit is generated by managers related to equity capital (Muhamed et al., 2014). Return on equity is calculated as operating income divided by book value of total equity (Anderson & Reeb, 2003; Liu et al., 2014).

$$\text{ROE} = \frac{\text{Operating Income}}{\text{Book value of Total Equity}}$$

3.4.1.1 Tobin's Q

Balsam et al. (2016), Ekholm and Maury (2014) and Laeven and Levine (2008) defined and calculated Tobin's Q as below;

$$\text{Tobin's Q} = \frac{\text{Book value Total Assets} - \text{Book value of Equity} + \text{Market Value of Equity}}{\text{Book value Total Assets}}$$

3.4.2 Independent Variables

Independent variable is a variable that remains stand alone and does not change by alternate variables. Independent variable influences dependent variable. Independent variables of this study are leverage, firm size, firm age, liquidity, growth opportunity, temperature, rainfall, El Nino (dummy) and flood (dummy).

3.4.2.1 Leverage

Leverage ratio is a term which measures company's capital structure. Leverage ratio is calculated by using different formulas. This study considers the following formula to measure leverage which used in previous research (e.g. Chi & Su, 2017; Sami et al., 2011).

$$\text{Leverage} = \frac{\text{Total Debt}}{\text{Total Assets}}$$

3.4.2.2 Firm Size

Firm size is an important factor of firm performance. This study uses total assets as a proxy of firm size (Adams et al., 2005; Burca & Batrinca, 2014).

$$\text{Firm Size} = \text{Natural Logarithm of Total Assets}$$

3.4.2.3 Firm Age

This study uses following term as proxy of firm age as it used in previous researches (e.g., Adams et al., 2005; Zouari & Taktak, 2014).

$$\text{Firm Age} = \text{Natural Logarithm of Number of Years firm Inception}$$

3.4.2.4 Liquidity

Liquidity refers the degree to which how quickly firm's assets or security can be transformed in cash without losing real value of assets. Following is the formula liquidity which is same as the previous studies (Davydov, 2016; Muhamed et al., 2014; Rachdi, 2013).

$$\text{Liquidity} = \frac{\text{Current Assets}}{\text{Current Liabilities}}$$

3.4.2.5 Growth Opportunity

High Growth firm attract more investors to invest in the company. Firm growth leads the company to generate more profit. Likewise, earlier researches (e.g. Laeven & Levine, 2008; Lim et al., 2017; Mirza & Javed, 2013) this study also considers the following measurement of growth opportunity.

$$\text{Growth Opportunity} = \text{Percentage Change in Total Sales}$$

3.4.2.6 Temperature

Temperature is degree of hot or cold measured in specific scale. High temperature can be caused of reduction of agricultural production level which might be affected firm's performance. This study uses Malaysian average annual temperature scales in Celsius.

3.4.2.7 Rainfall

Rainfall intensity is classified according to the rate of precipitation. Rainfall can be high or low depends on geographical area. Precipitation may helpful to the agricultural firms, but extreme rainfall somehow may impact firm's production. This study uses Malaysian average annual rainfall scales in millimeter.

3.4.2.8 El Nino

El Nino Southern Oscillation (ENSO) is climate event originated in equatorial zone of Pacific Ocean which affects atmospheric circulation worldwide and especially associated with droughts and floods (Kiladis & Diaz, 1989; Kovats et al., 2003). For this study, El Nino is a dummy variable. Value of dummy variable 1 for El Nino event, 0 otherwise.

3.4.2.9 Flood

Flood is a natural disaster which can cause extensive distraction of entire country. Flash flood can occur suddenly and caused for hazards such as landslides, damage to infrastructure, mud flows and even death (Collier, 2007). Flood is another dummy variable and value of 1 for flood, 0 otherwise.

3.5 Theoretical Framework

Figure 3.1 illustrates the theoretical framework of this study. The theoretical framework consists of all independent variables and dependent variable.

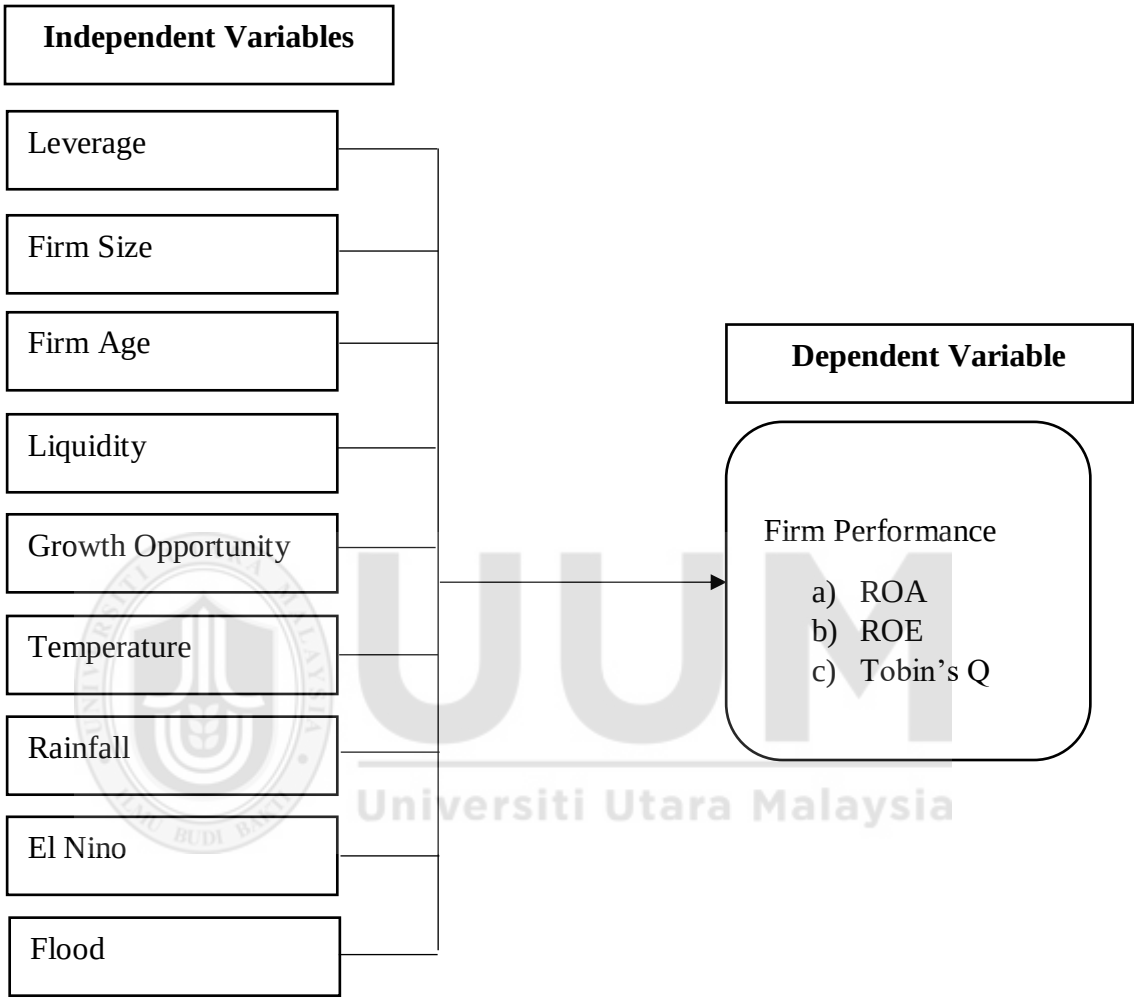

Figure 3.1
Theoretical Framework

3.6 Hypothesis of the Study

Hypothesis 1

a. There is significant relationship between leverage and ROA

b. There is significant relationship between leverage and ROE

c. There is significant relationship between leverage and Tobin's Q

Hypothesis 2

a) There is significant relationship between firm size and ROA

b) There is significant relationship between firm size and ROE

c) There is significant relationship between firm size and Tobin's Q

Hypothesis 3

a) There is significant relationship between firm age and ROA

b) There is significant relationship between firm age and ROE

c) There is significant relationship between firm age and Tobin's Q

Hypothesis 4

a) There is significant relationship between liquidity and ROA

b) There is significant relationship between liquidity and ROE

c) There is significant relationship between liquidity and Tobin's Q

Hypothesis 5

a) There is significant relationship between growth opportunity and ROA

b) There is significant relationship between growth opportunity and ROE

c) There is significant relationship between growth opportunity and Tobin's Q

Hypothesis 6

a) There is significant relationship between temperature and ROA

b) There is significant relationship between temperature and ROE

c) There is significant relationship between temperature and Tobin's

Hypothesis 7

a) There is significant relationship between rainfall and ROA

b) There is significant relationship between rainfall and ROE

c) There is significant relationship between rainfall and Tobin's Q

Hypothesis 8

a) There is significant relationship between El Nino and ROA

b) There is significant relationship between El Nino and ROE

c) There is significant relationship between El Nino and Tobin's Q

Hypothesis 9

a) There is significant relationship between flood and ROA

b) There is significant relationship between flood and ROE

c) There is significant relationship between flood and Tobin's Q

3.7 Panel Data Analysis

Pooled OLS is standard linear regression model and commonly used to test hypothesis. However, pooled OLS has some limitations. It enacts that intercept and slop coefficient of all cross-sections are same. It denies heterogeneity that may exist among the entities. Following is a general panel data regression model (Bollen & Brand, 2010).

$$Y_{it} = \alpha_i + \beta' X_{it} + \varepsilon_{it}$$

Where;

Y_{it} Represent the dependent variable for the cross-section unit *i* at time *t*, where *i* = 1….n and *t* = 1…..t

α_i Represent heterogeneity or an individual effect which comprises the constant term in the model, and it contains a set of observable individual or group specific variables or unobserved organization's characteristics which are not considered to vary over time (Wooldridge, 2006).

β' Represent the partial effect measure of in time *t* for the unit *i*

X_{it} Represent the j^{th} predictor variable for the unit *i* at time *t.* In this study there are K predictor variables indexed by j=1…….K which means that is a K dimensional vector

ε_{it} Represent the error term

Operational models for the above general equations are presented below.

$$ROA_{it} = \beta_0 + \beta_1 LEV_{it} + \beta_2 LnSIZE_{it} + \beta_3 LnAGE_{it} + \beta_4 LIQD_{it} + \beta_5 GRTH_{it} + \beta_6 TEMP_{it} + \beta_7 LnRAIN_{it} + \beta_8 END_{it} + \beta_9 FLDD_{it} + \varepsilon_{it} \quad (1)$$

$$ROE_{it} = \beta_0 + \beta_1 LEV_{it} + \beta_2 LnSIZE_{it} + \beta_3 LnAGE_{it} + \beta_4 LIQD_{it} + \beta_5 GRTH_{it} + \beta_6 TEMP_{it} + \beta_7 LnRAIN_{it} + \beta_8 END_{it} + \beta_9 FLDD_{it} + \varepsilon_{it} \quad (2)$$

$$TQ_{it} = \beta_0 + \beta_1 LEV_{it} + \beta_2 LnSIZE_{it} + \beta_3 LnAGE_{it} + \beta_4 LIQD_{it} + \beta_5 GRTH_{it} + \beta_6 TEMP_{it} + B_7 LnRAIN_{it} + \beta_8 END_{it} + \beta_9 FLDD_{it} + \varepsilon_{it} \quad (3)$$

Where:

ROA = Return on Assets for company i in period t;

ROE = Return on Equity for company i in period t;

TQ = Tobin's Q for company i in period t;

LEV = Leverage for company i in period t;

LnSIZE = Total Assets for company i in period t;

LnAGE = Number of years inception for company i in period t;

LIQD = Liquidity for company i in period t;

GRTH = Growth Opportunity for company i in period t;

TEMP = Temperature for company i in period t;

LnRAIN = Rainfall for company i in period t;

END = El Nino for company i in period t;

FLDD = Flood for company i in period t;

β = Coefficient to be estimated

ε = Error term

i = 1, 2, 3 …n, which means cross sectional units

t = 1, 2, 3 …t, are the time periods

The presented previous model can be adapted for use either with a fixed effect model or random effect model. The fixed effect model assumes that the individual effect of α_i is correlated with the predictor variable X_{it} while the random effect model assumes that the individual effect α_i is not correlated with the predictor variable X_{it}. Hence, the error term in random effects becomes ($\mu_i + \varepsilon_{it}$), whereby μ_i is the specific random effects element for the group which is similar to ε_{it} except that with μ_i, for every group there is a single draw that is considered in the regression identically for each time (Gujarati & Porter, 2010; Wooldridge, 2006).

3.8 Diagnostic Tests

Diagnostic tests are adopted to check multicollinearity, heteroskedasticity and autocorrelation problem of the study.

3.8.1 Variance Inflation Factors (VIF)

Variance inflation factors (VIF) is used as an indicator to detect multicollinearity in regression analysis. VIF measures how much the variance of the regression coefficient is inflated due to multicollinearity in the model. Multicollinearity is when there is correlation between independent variables which can adversely affect regression result. If the VIF value is more than 10, there is serious multicollinearity problem.

3.8.2 Breusch-Pagan / Cook-Weisberg Test and Modified Wald Test

Breusch-Pagan/Cook-Weisberg test and Modified Wald test are used to check heteroskedasticity problem. Heteroskedasticity refers to where the variance of errors is not the same for all variables. Null hypothesis shows the data is homoscedastic where

alternative hypothesis shows the data is heteroskedastic. By looking at probability chi^2, if the p value is less than 0.05 then null hypothesis is rejected and concluded that the data is significantly heteroskedastic.

3.8.3 Wooldridge Test

Autocorrelation is a characteristic of data in which the correlation between the values of the same variables is based on related objects. Autocorrelation in panel data is detected by Wooldridge test. Null hypothesis represents there is no autocorrelation whereby alternative hypothesis represents there is autocorrelation. If p value is less than 0.05 then reject null hypothesis and accept alternative hypothesis.

3.8.4 Lagrangian Multiplier Test and Hausman Test

Breusch and Pagan LM test is used to test random effect model. LM test is very important and it tests either random effect model or pooled OLS model will be applied for the study. If the probability $chibar^2$ is less than 0.05 then random effect model is better than pooled OLS model. On the other hand, Hausman test indicates either fixed effect or random effect model will be more appropriate for the study. Null hypothesis of Hausman test represents difference in coefficients not systematic. If the probability chi^2 is less than 0.05 then null hypothesis is rejected and we can conclude that difference in coefficients are systematic and fixed effect model is better than random effect model.

3.9 Chapter Summary

This chapter explains dependent and independent variables employed in this study. Based on the literature, theoretical framework and hypothesis been developed to investigate the relationship between predictor variables and explained variable. Besides that, this chapter also explains adopted model to analyze data.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

This chapter represents the data analysis, findings and discussion of the study. STATA version 12 is used to analysis panel data set. This chapter explains the findings of this study and discusses the acceptance or rejection of hypothesis based on the data has been tasted.

4.2 Descriptive Statistics

Table 4.1 shows the summary of the whole dataset of this study. Descriptive statistics describe the basic characteristics of sample size, independent variables and dependent variable.

Table 4.1
Descriptive Statistics

Variable	Number of Observations	Mean	Minimum	Maximum	Standard Deviation
ROA	462	0.0487	-0.3214	0.2476	0.0615
ROE	462	0.0646	-2.6844	0.3449	0.1654
TQ	462	1.0577	0.1855	3.5304	0.5209
LEV	462	0.2747	0.0029	1.8295	0.2406
LnSIZE	462	20.3623	17.2610	23.8948	1.2133
LnAGE	462	3.4710	0.6931	4.6634	0.7269
LIQD	462	9.1410	0.0262	252.7381	19.2060
GRTH	462	0.2286	-0.9317	30.7648	1.5839
TEMP	462	25.8315	25.4738	26.5500	0.2445
LnRAIN	462	5.5773	5.3995	5.7566	0.0902
END	462	1.2857	1.0000	2.0000	0.4522
FLDD	462	1.3571	1.0000	2.0000	0.4797

The result shows standard deviation, mean, minimum and maximum value of each variables used in this study. Mean value of ROA is 0.0487 where minimum and maximum value are -0.3214 and 0.2476 respectively. It indicates that on average Malaysian agriculture firms able to manage return on assets is 4.87 percent. On the other hand, mean value 0.0646 of ROE indicates that on average Malaysian agriculture firms generate 6.46 percent of return on equity. Furthermore, Tobin's Q mean value of 1.0577 indicates that agriculture firms are more valued in the market. On average Malaysian agriculture firms finance 27.47 percent of their operational activities through debt. Table 4.1 also illustrates that average natural logarithm of firm's total assets and age of the firms are 20.3623 and 3.471 respectively. Mean value of liquidity is 9.1410 shows that Malaysian agriculture firms have 9.1410 times ability to meet their short-term obligations. Growth opportunity's mean value of 0.2286 shows that on average agriculture firms sales increase by 22.86 percent each year. Mean value of temperature is 25.8315 which indicates that Malaysian annual average temperature is 25.83 degree Celsius. Besides that, the log of annual average rainfall is 5.5773, mean of El Nino is 1.2857 and mean of flood is 1.3571.

4.3 Correlation Matrix

Correlation defines as mutual relationship between two variables. In another word, correlation measures how one variable is related with another variable.

Table 4.2 illustrates the relationship among dependent and independent variables. Correlation matrix shows that firm size, growth opportunity and rainfall are negatively related with ROA. On the other hand, leverage, firm age, liquidity, temperature, El Nino and flood are negatively related with ROA. Table 4.2 also shows that firm size, growth opportunity and rainfall have positive relationship with ROE. However, leverage, firm age, liquidity, temperature, El Nino and flood are negatively associated with ROE. In addition, leverage, firm size, growth opportunity, rainfall and flood have positive relationship with Tobin's Q. Where, firm age, liquidity, temperature and El Nino are negatively related with Tobin's Q.

Table 4.2
Correlations Matrix

	ROA	ROE	TQ	LEV	LnSIZE	LnAGE	LIQD	GRTH	TEMP	LnRAIN	END	FLDD
ROA	1.0000	0.6985	0.3130	-0.1821	0.3499	-0.0328	-0.1377	0.1305	-0.2451	0.2947	-0.0546	-0.0318
		(0.0000)	(0.0000)	(0.0001)	(0.0000)	(0.4822)	(0.0030)	(0.0049)	(0.0000)	(0.0000)	(0.2414)	(0.4959)
ROE		1.0000	0.1308	-0.0563	0.2970	-0.0375	-0.0820	0.0764	-0.1237	0.1392	-0.0228	-0.0238
			(0.0049)	(0.2269)	(0.0000)	(0.4208)	(0.0785)	(0.1011)	(0.0077)	(0.0027)	(0.6246)	(0.6095)
TQ			1.0000	0.2944	0.3584	-0.0392	-0.1855	0.0191	-0.0605	0.0289	-0.0399	0.0518
				(0.0000)	(0.0000)	(0.4006)	(0.0001)	(0.6816)	(0.1939)	(0.5360)	(0.3922)	(0.2666)
LEV				1.0000	0.0610	-0.2901	-0.4028	-0.0004	0.0175	-0.0793	-0.0331	-0.0140
					(0.1908)	(0.0000)	(0.0000)	(0.9925)	(0.7069)	(0.0885)	(0.4778)	(0.7639)
LnSIZE					1.0000	0.1525	-0.2046	0.0920	0.1888	-0.0590	0.1548	0.0590
						(0.0010)	(0.0000)	(0.0482)	(0.0000)	(0.2056)	(0.0008)	(0.2059)
LnAGE						1.0000	0.1961	0.0058	0.1168	-0.0288	0.1048	0.0426
							(0.0000)	(0.9018)	(0.0120)	(0.5372)	(0.0243)	(0.3609)
LIQD							1.0000	-0.0368	0.0518	-0.0849	0.0095	-0.0076
								(0.4300)	(0.2665)	(0.0684)	(0.8382)	(0.8710)
GRTH								1.0000	-0.0593	0.0170	-0.1001	0.0759
									(0.2035)	(0.7149)	(0.0314)	(0.1034)
TEMP									1.0000	-0.5535	0.6243	-0.0421
										(0.0000)	(0.0000)	(0.3667)
LnRAIN										1.0000	-0.2498	-0.3261
											(0.0000)	(0.0000)
END											1.0000	0.1886
												(0.0000)
FLDD												1.0000

4.4 Regression Analysis

Table 4.3 illustrates the panel data regression analysis results and shows the significance level of predictor variables toward firm performance by using three different models are pooled OLS, fixed effect and random effect.

Table 4.3
Regression Analysis Results of Pooled OLS, Fixed Effect and Random Effect Model

	Return on Assets			Return on Equity			Tobin's Q		
VARIABLES	Pooled OLS	Fixed Effect	Random Effect	Pooled OLS	Fixed Effect	Random Effect	Pooled OLS	Fixed Effect	Random Effect
LEV	-0.0685***	-0.0616***	-0.0630***	-0.0728**	-0.121**	-0.0787**	0.603***	0.812***	0.775***
	-0.0112	-0.0126	-0.012	-0.034	-0.0494	-0.0365	-0.102	-0.101	-0.102
LnSIZE	0.0204***	0.00119	0.0115***	0.0466***	0.0316	0.0465***	0.158***	-0.242***	-0.0862***
	-0.00209	-0.00513	-0.00366	-0.00635	-0.0202	-0.0073	-0.0191	-0.0414	-0.0332
LnAGE	-0.0104***	0.00651	-0.00748	-0.0222**	0.00993	-0.0227*	-0.00184	0.177*	0.028
	-0.00351	-0.0112	-0.00695	-0.0106	-0.044	-0.0124	-0.032	-0.0904	-0.065
LIQD	-0.000356**	-0.000168	-0.000192	-0.000187	0.000368	-7.75E-05	0.000265	-2.5E-05	0.0000564
	-0.00014	-0.00013	-0.000128	-0.000426	-0.00051	-0.000441	-0.00128	-0.00105	-0.00107
GRTH	0.00338**	0.00586***	0.00537***	0.00468	0.00976**	0.00592	-0.0089	-0.00103	-0.0052
	-0.00152	-0.00119	-0.00119	-0.00461	-0.00469	-0.00458	-0.0139	-0.00962	-0.00996
TEMP	-0.0759***	-0.0607***	-0.0669***	-0.142***	-0.142***	-0.143***	-0.223	0.203*	0.077
	-0.0166	-0.0135	-0.0132	-0.0502	-0.0533	-0.0496	-0.151	-0.109	-0.111
LnRAIN	0.0881**	0.110***	0.103***	0.0574	0.0493	0.0569	0.136	0.703***	0.554**
	-0.037	-0.0288	-0.0287	-0.112	-0.113	-0.111	-0.337	-0.232	-0.24
END	0.0174**	0.0189***	0.0187***	0.0314	0.0331	0.032	-0.0316	-0.0224	-0.0243
	-0.00738	-0.00554	-0.00559	-0.0224	-0.0218	-0.022	-0.0672	-0.0447	-0.0466
FLDD	-0.0072	-0.00452	-0.00559	-0.0206	-0.0227	-0.021	0.0484	0.138***	0.114***
	-0.00596	-0.00463	-0.00461	-0.0181	-0.0182	-0.0178	-0.0542	-0.0373	-0.0385

Constant	1.147**	0.953**	0.994**	2.551	2.805	2.569	2.659	-4.172	-2.698
	-0.574	-0.447	-0.444	-1.74	-1.759	-1.713	-5.229	-3.61	-3.712
Observations	462	462	462	462	462	462	462	462	462
Number of Company		33	33		33	33		33	33

Standard errors in parentheses. ***, **, and * denoted statistical significance at the 1%, 5%, and 10% levels, respectively.

All models pooled OLS, fixed effect and random effect show that leverage has negative relationship with ROA at 1 percent significance level. It indicates that increase in leverage will lead to decrease in ROA. Similarly, leverage also negatively related with ROE but at 5 percent significance level. However, leverage and Tobin's Q are positively associated in 1 percent significant level, meaning that increase in leverage will lead to increase in firm's value.

Firm size is positive and statistically significant with ROA in pooled OLS and random effect models where it is not statistically significant in fixed effect model. It demonstrates that larger the firm is higher the ROA. Likewise, firm size and ROE also statistically significant and positively associated in pooled OLS and random effect model where firm size is not statistically significant with ROE in fixed effect model. In addition, OLS model shows that firm size is positively associated with Tobin's Q. However, fixed effect and random effect confirm that firm size and Tobin's Q are negatively related, meaning to say larger the firm size is lower the firms value.

Firm age is statistically significant and negatively related with ROA in pooled OLS model where fixed and random effect models show no significant relationship between firm age and ROA. Besides that, pooled OLS and random effect confirm that firm age and ROE are statistically significant and negatively related which means older firms generate less return on their equity. However, only fixed effect identifies the positive and significant relationship between firm age and Tobin's Q. It reported that longer the period of firm inception will lead to increase the firm value.

Liquidly is statistically significant and positively related with ROA in pooled OLS model meaning that increase in firm liquidity will increase in ROA. However, other two models show no significant relationship between liquidity and ROA. In addition, all models do not show any significant relationship between liquidity and ROE. Similarly, there is no significant relationship between liquidity and Tobin's Q.

Growth opportunity is statistically significant and positively associated with ROA in all models. Hence, increases in level of sales upsurge return on assets. In addition, only fixed effect demonstrates positive linkage between growth opportunity and ROE. On the other hand, no significant relationship exists between growth opportunity and Tobin's Q in all models.

Temperature is statistically significant and negatively related with firm performance measured by both ROA and ROE in all three models. It evidently shows that increase in temperature lead to decline in agriculture firm performance. However, in fixed effect model, temperature and Tobin's Q are statistically significant and positively associated where pooled OLS model and random effect model show no significant relationship between temperature and Tobin's Q.

Rainfall, in all models, is statistically significant and positively influence ROA, meaning that increase in the level of rainfall in Malaysia will upsurge ROA. However, rainfall is not important factor toward ROE as its not significant. Similarly, in pooled OLS model, rainfall

has no significant impact on Tobin's Q, where in fixed effect and random effect it statistically significant and has positive impact on Tobin's Q.

All models verify that El Nino is statistically significant and positively related with ROA. It evidently proves that existence of El Nino will increase ROA. However, there is no statistically significant relationship between El Nino and ROE. Similarly, in all models, there is no significant relationship between El Nino and Tobin's Q.

Pooled OLS, fixed effect and random effect confirm that flood dummy has no statistically significant relationship with ROA and ROE. Similarly, flood has no statistically significant relationship with Tobin's Q in OLS model. However, fixed effect and random effect models show that flood is statistically significant and positively associated with Tobin's Q.

4.5 Breusch and Pagan Lagrangian Multiplier and Hausman Test

Table 4.4 illustrates the result of LM test and Hausman test.

Table 4.4
LM Test and Hausman Test

		ROA	ROE	Tobin's Q
Breusch and Pagan LM test	prob>chibar^2	0.0000	0.0110	0.0000
Hausman test	prob>chi^2	0.0191	0.0224	0.0000

Based on the table 4.4, prob>chibar^2 of LM test is less than 0.05 for ROA, ROE and Tobin's Q. Therefore, it evidently suggests that random effect model is better than pooled OLS model. Besides that, prob>chi^2 of Hausman test is also less than 0.05 for ROA, ROE and

Tobin's Q. Hence, it clearly proves that fixed effect is more appropriate over random effect model for this study.

4.6 Post Estimation Diagnostic Tests

Table 4.5
Post Estimation Diagnostic Test

		ROA	ROE	Tobin's Q
	Mean			
Multicollinearity (VIF)	1.58			
Serial Correlation		0.0058	0.0504	0.0000
Heteroskedasticity		0.0000	0.0000	0.0000

Table 4.5 shows the results of post estimation diagnostic test. Variance inflation factor (VIF) is quantifies the multicollinearity problem in regression analysis. The mean value of VIF is 1.58. If the mean value of VIF is more than 10 then multicollinearity problem exists in the model. Since, VIF mean value is 1.58 and it is less than 10, therefore, this study is free from multicollinearity problem. Additionally, Wooldridge test is conducted in order to check autocorrelation among variables. The prob>F of Wooldridge test is less than 0.05 in ROA and Tobin's Q. Therefore, autocorrelation exists among variables when ROA and Tobin's Q are tested. However, when ROE is tasted, the prob>F of Wooldridge test is more than 0.05, hence, the model is free from autocorrelation. Furthermore, Modified Wald test is used to check heteroskedasticity problem in fixed effect model. The prob>chi^2 of Modified Wald test is less than 0.05, therefore, fixed effect model has heteroskedasticity problem.

Overall fixed effect model is better than pooled OLS and random effect model for this study. However, fixed effect model is considered to have autocorrelation and heteroskedasticity problems. Therefore, fixed effect with robust standard error is deployed to rectify the fixed effect autocorrelation and heteroskedasticity problems.

4.7 Fixed Effect Model with Robust Standard Error

Fixed effect model is suitable for this study. Due to the heteroskedasticity and autocorrelation problem exist in the model, fixed effect with robust standard error adopt to analyze the data. Final results of this study written as below.

Table 4.6
Robust Fixed Effect Model

	Fixed Effect (Robust)		
	Return on Assets	Return on Equity	Tobin's Q
VARIABLES			
LEV	-0.0616**	-0.121	0.812***
	-0.0236	-0.171	-0.231
LnSIZE	0.00119	0.0316	-0.242**
	-0.00671	-0.0224	-0.0971
LnAGE	0.00651	0.00993	0.177
	-0.0206	-0.0598	-0.139
LIQD	-0.000168*	0.000368*	-0.0000253
	-0.000093	-0.000187	-0.00106
GRTH	0.00586**	0.00976*	-0.00103
	-0.00236	-0.00536	-0.0134
TEMP	-0.0607***	-0.142**	0.203**
	-0.0109	-0.0557	-0.08
LnRAIN	0.110***	0.0493	0.703**
	-0.0233	-0.114	-0.304
END	0.0189***	0.0331**	-0.0224
	-0.00492	-0.0137	-0.0357
FLDD	-0.00452	-0.0227*	0.138***
	-0.0038	-0.0125	-0.0453
Constant	0.953***	2.805*	-4.172
	-0.273	-1.638	-3.092
Observations	462	462	462
Number of Company	33	33	33

Standard errors in parentheses. ***, **, and * denoted statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 4.6 illustrates that leverage has negative and significant relationship with ROA at 5 percent significance level. It explains that every 1 unit increase in leverage of the firm will result 0.0616 unit decrease in ROA of the firm. Increase in leverage beyond a certain level

may enhances the possibility of default risk and which causes higher cost of debt (Lim et al., 2017). Therefore, increase in cost of debt financing reduces firm's profitability. Similar results were found by Kale et al. (2009) and Liu et al. (2015). In the meantime, leverage is negative but insignificantly related with ROE. The result explains that leverage is not an important factor of influencing ROE. This finding is identical with Castro et al. (2010), Deng, Moshirian, Pham and Zein (2013) and Ko et al. (2016) who also reported insignificant relationship between leverage and ROE. However, leverage positively associated with Tobin's Q at 1 percent significance level. It explains that every 1 unit increase in firm leverage will result 0.812 unit increase in Tobin's Q. The result implies that firm with high level of debt is more valuable in the market as debt financing increases the total value of the firm. This finding is parallel with the results of Davydov (2016) and Elyasiani and Zhang (2015). Hence, hypothesis H1a and H1c are accepted and H1b is rejected.

Firm size is not significantly related with ROA. This finding is parallel with the findings of Chaudhuri et al. (2016), Clifford and Lindsey (2016) and Ekholm and Maury (2014). In addition, in line with the previous researches (e.g., Azeez, 2015; Hoque et al. 2013; Muhamed et al. 2014) this study has not found any significant relationship between firm size and ROE. Hence, firm's profitability does not depend on how larger or smaller the firm size is. However, firm size is negatively associated with Tobin's Q at 5 percent significant level. It explains for every 1 percent increase in firm size will result 0.00242 unit decrease in Tobin's Q. This could be attributed to the fact that smaller firm may monitors and executes every aspect of firm's operations effectively and efficiently.

Therefore, smaller firm is more favorable and higher valued than larger firm by the market (Atan, Alam, Said & Zamri, 2017). This finding is consistent with the findings of Ducassy et al. (2017) and Yu (2013). Hence, hypothesis H2a and H2b are rejected and H2c is accepted.

Firm age is not significantly related with ROA. This finding is supported by the findings of Frijns et al. (2016), Nimtrakoon (2015) and Zouari and Taktak (2014). Additionally, firm size insignificantly influences ROE. This finding is parallel with the findings of Azeez (2015) and Roy (2016). The results indicate that Malaysian agricultural firm's profitability is not influenced by how long the firm is incorporated in the market. Furthermore, firm age is insignificant in influencing Tobin's Q. It suggests that firm value in the market is neither raised nor declined due to the firm age. This result is similar with the findings of Adams et al. (2005), Bae et al. (2017), Chaudhuri et al. (2016) and Lim et al. (2017) who also found insignificant relationship between firm age and Tobin's Q. Therefore, this study rejects hypothesis H3a, H3b and H3c.

Liquidity negatively fosters ROA at 10 percent significance level. It explains that every 1 unit increase in firm liquidity will result 0.000168 unit decrease in ROA. The plausible reason of declining in profitability would be the fact that Investing in current assets provides lower returns than investing in non-current assets. Therefore, firm bears an opportunity cost of holding current assets and thus reduce firm's return on total assets. This result is consistent with the findings of Adams and Buckle (2003) and Davydov (2016). Liquidity, however, positively influences ROE at 10 percent significance level. It explains

that every 1 unit increase in firm liquidity will result 0.000368 unit increase in ROE. It reveals that high liquid firm generates more return on equity. In fact, high liquidity implies that firm has more liquid assets which can be converted into cash easily if needed. Liquid assets can be used in operational activities or invest in new project. Therefore, company does not borrow from outsider which reduces financing cost and ultimately increase firm's return. This finding is similar with the results of Heffernan and Fu (2010), Rachdi (2013) and Rahman (2015). Nevertheless, liquidity has no significant impact on Tobin's Q. Previously, number of prominent scholars also have not found any significant impact of liquidity on Tobin's Q (e.g., Davydov, 2016; Liang et al., 2013; Muhamed et al., 2014). Hence, based on the findings this study accepts H4a and H4b and rejects hypothesis H4c.

Growth opportunity is positively related with ROA at 5 percent significance level. It explains that every 1 unit increase in firm sales will result 0.00568 unit increase in ROA. Besides that, growth opportunity has also positive relationship with ROE at 10 percent significance level. It explains that every 1 unit increase in firm sales will result 0.00976 unit increase in ROE. These results clearly prove that high sales growth will increase firm' profitability in emerging markets (Davydov, 2016). In fact, increase in sales volume generate more revenues and consequently upsurge profitability. Similarly, Anderson and Reeb (2003), Cui and Mak (2002), King and Santor (2008), Maury (2006) and Nguyen and Nguyen (2015) reported positive relationship between growth opportunity and ROA. Lewandowski (2017) and Liu et al. (2015) confirmed growth opportunity has positive impact on ROE. Growth opportunity, however is insignificantly related with Tobin's Q. This finding is consistent with the findings of Davydov (2016) and Nguyen and Nguyen

(2015) who discovered insignificant relationship between growth opportunity and Tobin's Q. Hence, this study accepts hypothesis H5a and H5b and rejects H5c.

Temperature negatively impacts ROA at 1 percent significance level and ROE at 5 present significance level. It explains that every 1 unit increase in average annual temperature will result 0.0607 unit decrease in ROA and 0.142 unit decrease in ROE. These results show that high temperature will reduce firm's profitability. Climate and weather strongly influence agricultural production (Gornall et al., 2010). According to Hatfield and Prueger (2015) temperature primarily impacts plant development and extreme temperature reduces plant productivity. Therefore, reduction in firm's productivity and product quality reduce firm's revenues which negatively impacts firm's performance. On the other hand, temperature has positive influence on Tobin's Q at 5 percent significance level. It explains that every 1 unit increase in annual mean temperature will result 0.203 unit increase in Tobin's Q. This result implies that increase in temperature enhance the probability of increasing firm value. The plausible reason of increasing firm value would be the fact that decrease in firm's profitability might reduce the book value of total equity which will generate higher Tobin's Q. Hence, based on the result, hypothesis H6a, H6b and H6c are accepted.

Rainfall is positively associated with ROA at 1 percent significance level and Tobin's Q at 5 percent significant level. It explains that every 1 percent increase in average annual rainfall will result 0.0011 unit increase in ROA and 0.00703 unit increase in Tobin's Q. Akpalu, Rashid and Ringler (2011) concluded that precipitation is significant and

positively impact on maize yield in the Limpopo region of South Africa. In fact, soil moisture status and groundwater level will be affected in absence of rainfall (Kang, Khan & Ma, 2009). Therefore, rainfall is blessed for agro-based firms that increases crops productivity and quality. As a result of increasing crops productivity and better quality of crops make agro firm more profitable. Similarly, due to the higher precipitation rate, firm is seen as more valuable with higher profitability. Meanwhile, rainfall is not significant factor in influencing firm's performance, as measured by ROE. Hence, based on the findings, hypothesis H7a and H7c are accepted and H7b is rejected.

El Nino is positively related with ROA at 1 percent significance level and ROE at 5 percent significance level. It explains that agro firm in the El Nino year has ROA 0.0189 unit and ROE 0.0331 unit higher than a comparable year without El Nino event. These results imply that El Nino positively influences Malaysian agro firm's profitability. El Nino causes severe droughts and floods (Marengo & Espinoza, 2005; Nakagawa et al., 2000). Which may adversely impact agro-based firm performance. However, this study has found a positive impact of El Nino on ROA and ROE.

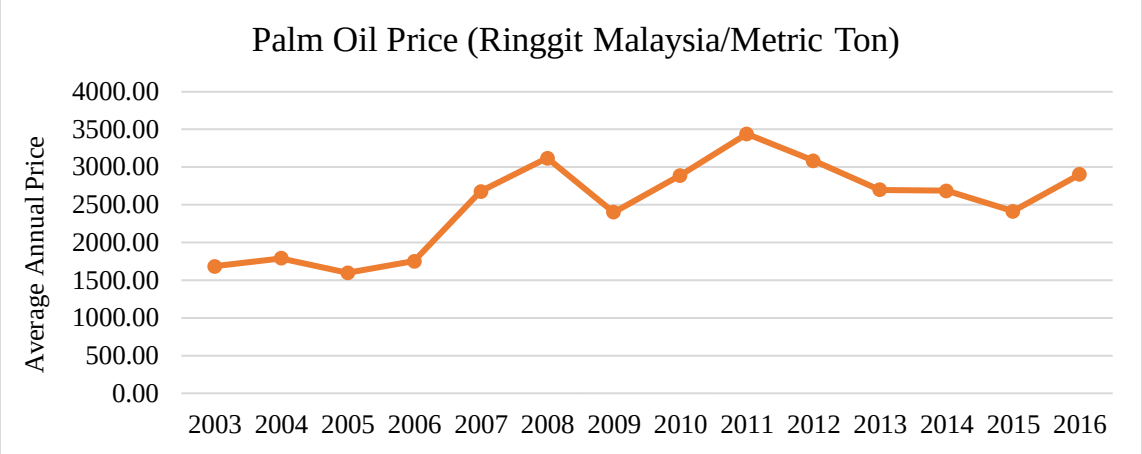

Figure 4.1
Average Annual Crude Palm Oil Price (2003-2016)
Source: Index Mundi

The plausible reason of these results could be based on the fact that a prolonged El Nino may not impact immediately on agricultural productions. Moreover, El Nino phenomena is more likely to cause the price of palm oil increases as supplies tighten. Figure 4.1 shows that in the El Nino year 2009-2010, palm oil price increases from RM 2402.68 per metric ton in 2009 to RM 2891.90 per metric ton in 2010. Besides that, in the El Nino year 2015-2016, palm oil price also rises from RM 2416.58 per metric ton in 2015 to RM 2904.64 per metric ton from in 2016. Therefore, increase in palm oil price generate more revenues subsequently upsurges firm's profitability. Meanwhile, El Nino is insignificant in influencing Tobin's Q. Hence, this study accepts hypothesis H8a and H8b and rejects H8c.

Flood is insignificant in influencing ROA. On the other hand, Flood is negatively associated with ROE at 10 percent significance level. It explains that agro firm in the year of flood has ROE 0.0224 unit lesser than a comparable year with no flood. This finding evidently indicates that flood adversely affects Malaysian agro firm performance. The plausible reason would be the fact that flood damages crops land, trees, transportation

infrastructure, farms buildings, machinery and equipment which causes agricultural productions decline (Sivakumar, 2005). One of the reason of declining sales volume is decrease in quantity production and where the fixed cost remains unchanged. Therefore, the cost of goods sold rises and declining in firm's production level directly impact on firm's profitability. Banerjee (2010) also concluded that extreme flood causes of dropping yield rates and agriculture firm performance in Bangladesh. Nevertheless, flood is positively related with Tobin's Q at 1 percent significance level. It explains that agro firm value is 0.138 unit higher in the year of flood than the year of no flood. This finding demonstrates that flood increases Malaysian agro firm's value. Hence, based on the results, hypothesis H9a is rejected, and H9b and H9c are accepted.

4.8 Summary of Hypothesis Testing

Table 4.7
Summary of Hypothesis Testing

Hypothesis	**Findings**	**Accept/ Reject**
H1: There is significant relationship between		
a) Leverage and ROA	Negative Significant	Accepted
b) Leverage and ROE	Negative Insignificant	Rejected
c) Leverage and Tobin's Q	Positive Significant	Accepted
H2: There is significant relationship between		
d) Firm size and ROA	Positive Insignificant	Rejected
e) Firm size and ROE	Positive Insignificant	Rejected
f) Firm size and Tobin's Q	Negative Significant	Accepted

H3: There is significant relationship between		
d) Firm age and ROA	Positive Insignificant	Rejected
e) Firm age and ROE	Positive Insignificant	Rejected
f) Firm age and Tobin's Q	Positive Insignificant	Rejected
H4: There is significant relationship between		
d) Liquidity and ROA	Negative Significant	Accepted
e) Liquidity and ROE	Positive Significant	Accepted
f) Liquidity and Tobin's Q	Positive Insignificant	Rejected
H5: There is significant relationship between		
d) Growth opportunity and ROA	Positive Significant	Accepted
e) Growth opportunity and ROE	Positive Significant	Accepted
f) Growth opportunity and Tobin's Q	Negative Insignificant	Rejected
H6: There is significant relationship between		
d) Temperature and ROA	Negative Significant	Accepted
e) Temperature and ROE	Negative Significant	Accepted
f) Temperature and Tobin's	Positive Significant	Accepted
H7: There is significant relationship between		
d) Rainfall and ROA	Positive Significant	Accepted
e) Rainfall and ROE	Positive Insignificant	Rejected
f) Rainfall and Tobin's Q	Positive Significant	Accepted
H8: There is significant relationship between		
d) El Nino and ROA	Positive Significant	Accepted
e) El Nino and ROE	Positive Significant	Accepted
f) El Nino and Tobin's Q	Negative Insignificant	Rejected
H9: There is significant relationship between		
d) Flood and ROA	Negative insignificant	Rejected
e) Flood and ROE	Negative Significant	Accepted
f) Flood and Tobin's Q	Positive Significant	Accepted

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.1 Introduction

This chapter summarizes the findings of this study. Besides that, this chapter draws a conclusion and highlights the limitation of the study and recommendations for future research.

5.2 Summary of Findings

The aim of this study is to examine the impacts of climate change and firm characteristics on Malaysian agro firm performance. Predictor variables such as leverage, firm size, firm age, liquidity, growth opportunity, temperature, rainfall, El Nino and flood are employed in this study whereby dependent variable is firm performance measured by ROA, ROE and Tobin's Q. Final sample of this study consists of balanced panel data set of 33 plantation firms with 462 firm-year observations from 2003 to 2016. A series of regression models such as pooled OLS, fixed effect, and random effect model are used to analyse the panel dataset. This study considers the results of fixed effect model as it is more appropriate over other models.

The regression results empirically show that leverage negatively and significantly influences ROA but insignificantly influences ROE. This implies that higher level of firm debt declines firm performance, as measured by ROA. However, leverage is positive and

significantly associated with Tobin's Q. This result provides evidence to suggest that high levered firm is more valued in the market. Firm size does not seem to be a significant factor in influencing firm performance, as measured by ROA and ROE. The results suggest that profitability does not depend on how larger or smaller the firm is. At the same time, firm size negatively and significantly impacts Tobin's Q. This result evidently proves that larger firm is less valued than smaller firm in the market. This study also finds that firm age is not a significant factor in influencing firm performance, as measured by ROA, ROE and Tobin's Q. These results infer that older firm and newer firm perform equally. Liquidity seems to be significant and impacts firm performance measured by ROA and ROE. Liquidity negatively and significantly impacts ROA whereby it positively and significantly impacts ROE. At the same time, liquidity has no significant impacts on Tobin's Q. Growth opportunity has positive and significant relationship with ROA and ROE. This significant positive relationship implies that firm with high sales growth upsurges firm profitability. Meanwhile, growth opportunity insignificantly impacts Tobin's Q.

The empirical findings also show that temperature is significant factor and negatively impacts firm performance, as measured by ROA and ROE. This indicates that increase in annual mean temperature lead to decline firm profitability. At the same time, temperature seems to be positively related with firm valuation, as measured by Tobin's Q. Rainfall positively and significantly related to ROA. This indicates that Malaysian agro firms earn more profit when precipitation rate is high. However, rainfall has no significant relationship with ROE. At the same time, rainfall positively and significantly impacts Tobin's Q. This result provides evidence to suggest that Tobin's Q significantly higher for

firm with higher precipitation rate. El Nino is found to be significant and positively impacts ROA and ROE. These results evidently prove that in the presence of El Nino event increases firm performance. However, El Nino is not significant factor in influencing Tobin's Q. The impact of flood on firm performance is significant and negative, as measured by ROE. This indicates that profitability decreases because of flood. However, flood does not seem to be a significant factor of firm performance, as measured by ROA. Nevertheless, flood positively and significantly impacts Tobin's Q. This finding suggests that when flood strike, firm is more valued in the market.

5.3 Research Contributions

Previously, none of the study has been conducted on the direct impacts of climate change factors such as temperature, rainfall, El Nino and flood on agro firm performance measured by ROA, ROE and Tobin's Q. Therefore, this study contributes to the literature, for instance, temperature, rainfall, El Nino and flood significantly impacts firm performance. Besides that, this study also contributes to the company in many aspects. This study will be beneficial for top level management of the company to identify the factors that are associated with financial performance. Therefore, manager can implement proper decision to enhance firm's profitability and caution with the environmental factors those might affect overall financial health of the firm.

5.4 Limitations of the Study

Despite of the findings of this study and contributions to the literature, it has some limitations. Firstly, this study is confined to the Malaysian public listed plantation firms. It would be better to generalise the findings if private plantation firms included or broaden the geographical areas and increase the number of sample by considering other ASEAN countries' plantation or agro and related firms. Secondly, to accomplish a research needs time. It's quite tough to finish a research in short time period. Approximately four months' time was allocated to accomplish this study. The time constraint has reduced the sample size and study period. Another reason of reducing the sample size is data unavailability of the firms. Thirdly, this study uses certain factors such as environmental factor and financial factor to examine the impact on firm performance. There might be other factors which impact firm performance are ignored. However, all these limitations would not be disregarded due to inaccessibility of data sources and company's annual report does not provide some information regarding other variables.

5.5 Recommendation for Future Research

This study focused on Malaysian agro firm performance. However, further study would be conducted with the extend of areas across different countries to examine the impact of climate change on firm performance. As this study has covered 462 firm year observations from the period of 2003 to 2016, further research can extend the period of study to investigate long term impacts of climate change on firm performance. Additionally, this study has only bounded with financial factors of the company and country's environmental factors. However, other factors such as macroeconomic factors and regional factors can be added to the future research to find out more efficient results of firm performance.

References

Adams, M., & Buckle, M. (2003). The determinants of corporate financial performance in the Bermuda insurance market. *Applied Financial Economics*, *13*(2), 133-143.

Adams, R. B., Almeida, H., & Ferreira, D. (2005). Powerful CEOs and Their Impact on Corporate Performance. *Review of Financial Studies*, *18*(4), 1403-1432.

Ahmad, Z., Abdullah, N. M., & Roslan, S. (2012). Capital Structure Effect on Firms Performance: Focusing on Consumers and Industrials Sectors on Malaysian Firms. *International Review of Business Research Papers*, *8*(5), 137-155.

Akpalu, W., Rashid, H. M., & Ringler, C. (2011). Climate variability and maize yield in the Limpopo region of South Africa: Results from GME and MELE methods. *Climate and Development*, *3*(2), 114-122.

Alam, M. M., Taufique, K. M., & Sayal, A. (2017). Do climate changes lead to income inequality? Empirical study on the farming community in Malaysia. *International Journal of Environment and Sustainable Development*, *16*(1), 43-59.

Anderson, B. S., & Eshima, Y. (2013). The influence of firm age and intangible resources on the relationship between entrepreneurial orientation and firm growth among Japanese SMEs. *Journal of Business Venturing*, *28*(3), 413-429.

Anderson, R. C., & Reeb, D. M. (2003). Founding-Family Ownership and Firm Performance: Evidence from the S&P 500. *The Journal of Finance*, *58*(3), 1301-1328.

Atan, R., Alam, M. M., Said, J., & Zamri, M. (2017). The Impacts of Environmental, Social, and Governance Factors on Firm Performance: Panel Study of Malaysian Companies. *Management of Environmental Quality*, *28*(6).

Aydinalp, C., & Cresser, M. S. (2008). The Effects of Global Climate Change on Agriculture. *American-Eurasian Journal of Agricultural & Environmental Sciences*, *3*(5), 672-676.

Azeez, D. A. (2015). Corporate Governance and Firm Performance: Evidence from Sri Lanka. *Journal of Finance and Bank Management*, *3*(1), 180-189.

Bae, J., Kim, S., & Oh, H. (2017). Taming polysemous signals: The role of marketing intensity on the relationship between financial leverage and firm performance. *Review of Financial Economics*, *33*, 29-40.

Balsam, S., Puthenpurackal, J., & Upadhyay, A. (2016). The Determinants and Performance Impact of Outside Board Leadership. *Journal of Financial and Quantitative Analysis*, *51*(04), 1325-1358.

Banerjee, L. (2010). Effects of Flood on Agricultural Productivity in Bangladesh. *Oxford Development Studies*, *38*(3), 339-356.

Bashir, A. M. (2003). Determinants of profitability in Islamic banks: Some evidence from the Middle East. *Islamic Economic Studies*, *11*(1), 31-57.

Ben Slama Zouari, S., & Boulila Taktak, N. (2014). Ownership structure and financial performance in Islamic banks. *International Journal of Islamic and Middle Eastern Finance and Management*, *7*(2), 146-160.

Berry, B. J., & Okulicz-Kozaryn, A. (2008). Are there ENSO signals in the macroeconomy? *Ecological Economics*, *64*(3), 625-633.

Besser, T. L. (1999). Community Involvement and the Perception of Success Among Small Business Operators in Small Towns. *Journal of Small Business Management*, *37*(4), 16-29.

Bollen, K. A., & Brand, J. E. (2010). A General Panel Model with Random and Fixed Effects: A Structural Equations Approach. *Social Forces*, *89*(1), 1-34.

Bosello, F., & Zhang, J. (2005). Assessing Climate Change Impacts: Agriculture. *SSRN Electronic Journal*. doi:10.2139/ssrn.771245

Burca, A., & Batrinca, G. (2014). The Determinants of Financial Performance in the Romanian Insurance Market. *International Journal of Academic Research in Accounting, Finance and Management Sciences*, *4*(1).

Cashin, P., Mohaddes, K., & Raissi, M. (2017). Fair weather or foul? The macroeconomic effects of El Niño. *Journal of International Economics*, *106*, 37-54.

Chang, S., & Boontham, W. (2017). Post-privatization speed of state ownership relinquishment: Determinants and influence on firm performance. *The North American Journal of Economics and Finance*, *41*, 82-96.

Chaudhuri, K., Kumbhakar, S. C., & Sundaram, L. (2016). Estimation of firm performance from a MIMIC model. *European Journal of Operational Research*, *255*(1), 298-307.

Chi, J. D., & Su, X. (2017). The Dynamics of Performance Volatility and Firm Valuation. *Journal of Financial and Quantitative Analysis*, *52*(01), 111-142.

Clifford, C. P., & Lindsey, L. (2016). Blockholder Heterogeneity, CEO Compensation, and Firm Performance. *Journal of Financial and Quantitative Analysis*, *51*(05), 1491-1520.

Collier, C. G. (2007). Flash flood forecasting: What are the limits of predictability? *Quarterly Journal of the Royal Meteorological Society*, *133*(622), 3-23.

Country Historical Climate-Malaysia. (n.d.). *Climate Change Knowledge Portal*. Retrieved from http://sdwebx.worldbank.org/climateportal/index.cfm?page=country_historical_climate&ThisRegion=Asia&ThisCCode=MYS

Cui, H., & Mak, Y. (2002). The relationship between managerial ownership and firm performance in high R&D firms. *Journal of Corporate Finance*, *8*(4), 313-336.

Daher, L., & Le Saout, E. (2015). The Determinants of the Financial Performance of Microfinance Institutions: Impact of the Global Financial Crisis. *Strategic Change*, *24*(2), 131-148.

Davydov, D. (2016). Debt structure and corporate performance in emerging markets. *Research in International Business and Finance*, *38*, 299-311.

Deng, H., Moshirian, F., Pham, P. K., & Zein, J. (2013). Creating Value by Changing the Old Guard: The Impact of Controlling Shareholder Heterogeneity on Firm Performance and Corporate Policies. *Journal of Financial and Quantitative Analysis*, *48*(06), 1781-1811.

Ducassy, I., & Guyot, A. (2017). Complex ownership structures, corporate governance and firm performance: The French context. *Research in International Business and Finance*, *39*, 291-306.

Economic Developments in 2016. (n.d.). *Bank Negara Malaysia*. Retrieved from https://www.bnm.gov.my/files/publication/ar/en/2016/cp01.pdf

Ekholm, A., & Maury, B. (2014). Portfolio Concentration and Firm Performance. *Journal of Financial and Quantitative Analysis*, *49*(04), 903-931.

Elyasiani, E., & Zhang, L. (2015). Bank holding company performance, risk, and "busy" board of directors. *Journal of Banking & Finance*, *60*, 239-251.

Foster, A., & Rosenzweig, M. (2004). Agricultural Productivity Growth, Rural Economic Diversity, and Economic Reforms: India, 1970–2000. *Economic Development and Cultural Change*, *52*(3), 509-542.

Frijns, B., Dodd, O., & Cimerova, H. (2016). The impact of cultural diversity in corporate boards on firm performance. *Journal of Corporate Finance*, *41*, 521-541.

Gao, H., Harford, J., & Li, K. (2017). CEO Turnover–Performance Sensitivity in Private Firms. *Journal of Financial and Quantitative Analysis*, *52*(02), 583-611.

Garcia-Castro, R., Ariño, M. A., & Canela, M. A. (2010). Does Social Performance Really Lead to Financial Performance? Accounting for Endogeneity. *Journal of Business Ethics*, *92*(1), 107-126.

GDP growth (annual %). (n.d.). *The World Bank*. Retrieved from https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG

Gong, G., Louis, H., & Sun, A. X. (2008). Earnings Management and Firm Performance Following Open-Market Repurchases. *The Journal of Finance*, *63*(2), 947-986.

Gornall, J., Betts, R., Burke, E., Clark, R., Camp, J., Willett, K., & Wiltshire, A. (2010). Implications of climate change for agricultural productivity in the early twenty-first century. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *365*(1554), 2973-2989.

Gujarati, D. N., & Porter, D. C. (2010). *Essentials of econometrics* (4th ed.). New York: McGraw-Hill.

Gurbuz, A. O., Aybars, A., & Kutlu, O. (2010). Corporate Governance and Financial Performance with a Perspective on Institutional Ownership: Empirical Evidence from Turkey. *Journal of Applied Management Accounting Research*, *8*(2), 21-37.

Hanifa, R., & Hudaib, M. (2006). Corporate Governance Structure and Performance of Malaysian Listed Companies. *Journal of Business Finance & Accounting*, *33*(7), 1034-1062.

Hatfield, J. L., & Prueger, J. H. (2015). Temperature extremes: Effect on plant growth and development. *Weather and Climate Extremes*, *10*, 4-10.

Heffernan, S. A., & Fu, X. (2010). Determinants of financial performance in Chinese banking. *Applied Financial Economics*, *20*(20), 1585-1600.

Hermuningsih, S. (2013). Profitability, Growth Opportunity, Capital Structure and The Firm Value. *Buletin Ekonomi Moneter dan Perbankan*, *16*(2), 115-136.

Hertel, T. W., Burke, M. B., & Lobell, D. B. (2010). The poverty implications of climate-induced crop yield changes by 2030. *Global Environmental Change*, *20*(4), 577-585.

Hoque, M. Z., Islam, M. R., & Azam, M. N. (2013). Board Committee Meetings and Firm Financial Performance: An Investigation of Australian Companies. *International Review of Finance*, *13*(4), 503-528.

Hoshi, T., Kashyap, A., & Scharfstein, D. (1991). Corporate Structure, Liquidity, and Investment: Evidence from Japanese Industrial Groups. *The Quarterly Journal of Economics*, *106*(1), 33-60.

Ibrahim, A. Z., & Alam, M. M. (2016). Climatic changes, government interventions, and paddy production: an empirical study of the Muda irrigation area in Malaysia. *International Journal of Agricultural Resources, Governance and Ecology*, *12*(3), 292.

IMF Executive Board Concludes 2017 Article IV Consultation with Malaysia. (2017, April 28). *International Monetary Fund*. Retrieved from https://www.imf.org/en/News/Articles/2017/04/28/pr17143-malaysia-imf-executive-board-concludes-2017-article-iv-consultation

Iswati, S., & Anshori, M. (2007). The Influence of Intellectual Capital to Financial Performance at Insurance Companies in Jakarta Stock Exchange (JSE). *Proceedings of the 13th Asia Pacific Management Conference*, 1393-1399.

Kale, J. R., Reis, E., & Venkateswaran, A. (2009). Rank-Order Tournaments and Incentive Alignment: The Effect on Firm Performance. *The Journal of Finance*, *64*(3), 1479-1512.

Kang, Y., Khan, S., & Ma, X. (2009). Climate change impacts on crop yield, crop water productivity and food security – A review. *Progress in Natural Science*, *19*(12), 1665-1674.

Karla, N., Chander, S., Pathak, H., Aggarwal, P. K., Gupta, N. C., Sehgal, M., & Chakraborty, D. (2007). Impacts of climate change on agriculture. *Outlook on AGRICULTURE*, *36*(2), 109-118.

King, M. R., & Santor, E. (2008). Family values: Ownership structure, performance and capital structure of Canadian firms. *Journal of Banking & Finance*, *32*(11), 2423-2432.

Ko, H. A., Tong, Y., Zhang, F., & Zheng, G. (2016). Corporate governance, product market competition and managerial incentives: Evidence from four Pacific Basin countries. *Pacific-Basin Finance Journal*, *40*, 491-502.

Kovats, R. S., Bouma, M. J., Hajat, S., Worrall, E., & Haines, A. (2003). El Niño and health. *The Lancet*, *362*, 1481-1489.

Kuala Lumpur Monthly Climate Averages. (n.d.). *World Weather Online*. Retrieved from https://www.worldweatheronline.com/kuala-lumpur-weather-averages/kuala-lumpur/my.aspx

Kurukulasuriya, P., & Rosenthal, S. (2003). Climate Change and Agriculture: A Review of Impacts and Adaptations. *Environment Department Papers, 91*.

Laeven, L., & Levine, R. (2008). Complex Ownership Structures and Corporate Valuations. *Review of Financial Studies, 21*(2), 579-604.

Lau, C. K. (2016). How corporate derivatives use impact firm performance? *Pacific-Basin Finance Journal, 40*, 102-114.

Lewandowski, S. (2017). Corporate Carbon and Financial Performance: The Role of Emission Reductions. *Business Strategy and the Environment*.

Liang, H., Ching, Y. P., & Chan, K. C. (2013). Enhancing bank performance through branches or representative offices? Evidence from European banks. *International Business Review, 22*(3), 495-508.

Lim, C. Y., Wang, J., & Zeng, C. (. (2017). China's "Mercantilist" Government Subsidies, the Cost of Debt and Firm Performance. *Journal of Banking & Finance, 86*, 37-52.

Liu, Y., Miletkov, M. K., Wei, Z., & Yang, T. (2015). Board independence and firm performance in China. *Journal of Corporate Finance, 30*, 223-244.

Loderer, C. F., & Waelchli, U. (2010). Firm Age and Performance. *SSRN Electronic Journal*.

Mahidin, M. U. (2017, August 18). Malaysia Ecnomy. *Department of Statistics, Malaysia*. Retrieved from https://www.dosm.gov.my/v1/index.php?r=column/cthemeByCat&cat=100&bul_id=bFNwdUlVMm5malFyYXFYdUp3THlEQT09&menu_id=TE5CRUZCblh4ZTZMODZIbmk2aWRRQT09

Malaysia Overview. (2017, September). *The World Bank*. Retrieved from http://www.worldbank.org/en/country/malaysia/overview

Marengo, J. A., & Espinoza, J. C. (2015). Extreme seasonal droughts and floods in Amazonia: causes, trends and impacts. *International Journal of Climatology, 36*(3), 1033-1050.

Margaritis, D., & Psillaki, M. (2010). Capital structure, equity ownership and firm performance. *Journal of Banking & Finance, 34*(3), 621-632.

Maury, B. (2006). Family ownership and firm performance: Empirical evidence from Western European corporations. *Journal of Corporate Finance, 12*(2), 321-341.

Mirza, S. A., & Javed, A. (2013). Determinants of financial performance of a firm: Case of Pakistani stock market. *Journal of Economics and International Finance, 5*(2), 43-52.

Moy, C. M., Seltzer, G. O., Rodbell, D. T., & Anderson, D. M. (2002). Variability of El Niño/Southern Oscillation activity at millennial timescales during the Holocene epoch. *Nature*, *420*(6912), 162-165.

Muhamed, A. B., Stratling, R., & Salama, A. (2014). The Impact of Government Investment Organizations in Malaysia on The Performance of Their Portfolio Companies. *Annals of Public and Cooperative Economics, 85*(3), 453-473.

Munodawafa, A. (2012). The Effect of Rainfall Characteristics and Tillage on Sheet Erosion and Maize Grain Yield in Semiarid Conditions and Granitic Sandy Soils of Zimbabwe. *Applied and Environmental Soil Science, 2012,* 1-8.

Nakagawa, M., Tanaka, K., Nakashizuka, T., Ohkubo, T., Kato, T., Maeda, T., … Seng, L. H. (2000). Impact of severe drought associated with the 1997–1998 El Niño in a tropical forest in Sarawak. *Journal of Tropical Ecology*, *16*(3), 355-367.

Nguyen, T., & Nguyen, H. (2015). Capital Structure and Firms' Performance: Evidence from Vietnam's Stock Exchange. *International Journal of Economics and Finance*, *7*(12), 1.

Nimtrakoon, S. (2015). The relationship between intellectual capital, firms' market value and financial performance. *Journal of Intellectual Capital*, *16*(3), 587-618.

Ongore, V. O., & Kusa, G. B. (2013). Determinants of Financial Performance of Commercial Banks in Kenya. *International Journal of Economics and Financial Issues, 3*(1), 237-252.

Piao, S. (2010). The impacts of climate change on water resources and agriculture in China. *Nature, 467,* 43-51.

Production of Cocoa Beans by Region. (n.d.). *Malaysia Cocoa Board*. Retrieved from http://www.koko.gov.my/lkm/industry/statistic/p_cocoabean.cfm

Rachdi, H. (2013). What Determines the Profitability of Banks During and before the International Financial Crisis? Evidence from Tunisia. *International Journal of Economics, Finance and Management*, *2*(4), 330-337.

Rahman, M. M., Hamid, M. K., & Khan, M. A. (2015). Determinants of Bank Profitability: Empirical Evidence from Bangladesh. *International Journal of Business and Management, 10*(8).

Rosenzweig, C., Tubiello, F. N., Goldberg, R., Mills, E., & Bloomfield, J. (2002). Increased crop damage in the US from excess precipitation under climate change. *Global Environmental Change, 12*(3), 197-202.

Roy, A. (2016). Corporate Governance and Firm Performance: A Study of Indian Listed Firms. *Metamorphosis: A Journal of Management Research, 15*(1), 31-46.

Sami, H., Wang, J., & Zhou, H. (2011). Corporate governance and operating performance of Chinese listed firms. *Journal of International Accounting, Auditing and Taxation, 20*(2), 106-114.

Siddik, M., Kabiraj, S., & Joghee, S. (2017). Impacts of Capital Structure on Performance of Banks in a Developing Economy: Evidence from Bangladesh. *International Journal of Financial Studies, 5*(2), 13.

Sivakumar, M. V. (2005). Impacts of Natural Disasters in Agriculture, Rangeland and Forestry: An Overview. *Natural Disasters and Extreme Events in Agriculture*, 1-22.

Tobin, J. (1958). Liquidity Preference as Behavior Towards Risk. *The Review of Economic Studies, 25*(2), 65.

Upadhyay, A. D., Bhargava, R., Faircloth, S., & Zeng, H. (2017). Inside directors, risk aversion, and firm performance. *Review of Financial Economics, 32*, 64-74.

Weather statistics for Kuala Lumpur. (n.d.). *YR*. Retrieved from https://www.yr.no/place/Malaysia/Kuala_Lumpur/Kuala_Lumpur/statistics.html

Weng, P., & Chen, W. (2017). Doing good or choosing well? Corporate reputation, CEO reputation, and corporate financial performance. *The North American Journal of Economics and Finance, 39*, 223-240.

Wooldridge, J. M. (2006). *Introductory econometrics: A modern approach*. Mason, Ohio: South-Western Cengage Learning.

Yu, M. (2013). State ownership and firm performance: Empirical evidence from Chinese listed companies. *China Journal of Accounting Research, 6*(2), 75-87.

Zhang, H., Turner, N. C., Poole, M. L., & Simpson, N. (2006). Crop production in the high rainfall zones of southern Australia — potential, constraints and opportunities. *Australian Journal of Experimental Agriculture, 46*(8), 1035-1049.

Appendices

Appendix A: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
roa	462	.0487405	.0614871	-.3214462	.2476475
roe	462	.0645543	.1654117	-2.684369	.3448657
tq	462	1.057658	.5208804	.1855316	3.530413
lev	462	.2746814	.2406107	.0029096	1.829493
lnsize	462	20.3623	1.213259	17.26095	23.89482
lnage	462	3.47099	.7268876	.6931472	4.663439
liqd	462	9.140968	19.20598	.0261835	252.7381
grth	462	.2285838	1.583858	-.9316685	30.76483
temp	462	25.83147	.2445321	25.47379	26.55
lnrain	462	5.577328	.0902407	5.399546	5.756627
end	462	1.285714	.4522437	1	2
fldd	462	1.357143	.4796768	1	2

Appendix B: Correlation Matrix

	roa	roe	tq	lev	lnsize	lnage	liqd
roa	1.0000						
roe	0.6985	1.0000					
tq	0.3130	0.1308	1.0000				
lev	-0.1821	-0.0563	0.2944	1.0000			
lnsize	0.3499	0.2970	0.3584	0.0610	1.0000		
lnage	-0.0328	-0.0375	-0.0392	-0.2901	0.1525	1.0000	
liqd	-0.1377	-0.0820	-0.1855	-0.4028	-0.2046	0.1961	1.0000
grth	0.1305	0.0764	0.0191	-0.0004	0.0920	0.0058	-0.0368
temp	-0.2451	-0.1237	-0.0605	0.0175	0.1888	0.1168	0.0518
lnrain	0.2947	0.1392	0.0289	-0.0793	-0.0590	-0.0288	-0.0849
end	-0.0546	-0.0228	-0.0399	-0.0331	0.1548	0.1048	0.0095
fldd	-0.0318	-0.0238	0.0518	-0.0140	0.0590	0.0426	-0.0076

	grth	temp	lnrain	end	fldd
grth	1.0000				
temp	-0.0593	1.0000			
lnrain	0.0170	-0.5535	1.0000		
end	-0.1001	0.6243	-0.2498	1.0000	
fldd	0.0759	-0.0421	-0.3261	0.1886	1.0000

Appendix C: Variance Inflation Factor

Variable	VIF	1/VIF
temp	2.92	0.342877
lnrain	1.98	0.504578
end	1.98	0.505402
fldd	1.45	0.689477
liqd	1.29	0.773886
lev	1.29	0.773991
lnage	1.16	0.862841
lnsize	1.15	0.872192
grth	1.03	0.967551
Mean VIF	1.58	

Appendix D: Pooled OLS Regression Result (ROA)

Source	SS	df	MS
Model	.570107042	9	.063345227
Residual	1.17277631	452	.002594638
Total	1.74288335	461	.003780658

Number of obs	462
F(9, 452)	24.41
Prob > F	0.0000
R-squared	0.3271
Adj R-squared	0.3137
Root MSE	.05094

roa	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lev	-.0684579	.0112074	-6.11	0.000	-.090483	-.0464328
lnsize	.0203873	.0020938	9.74	0.000	.0162725	.024502
lnage	-.0103727	.0035136	-2.95	0.003	-.0172778	-.0034676
liqd	-.0003556	.0001404	-2.53	0.012	-.0006316	-.0000797
grth	.0033789	.0015228	2.22	0.027	.0003863	.0063714
temp	-.0759072	.0165685	-4.58	0.000	-.108468	-.0433464
lnrain	.0881489	.0370102	2.38	0.018	.0154155	.1608823
end	.0174315	.007379	2.36	0.019	.0029301	.0319329
fldd	-.0071974	.0059563	-1.21	0.228	-.018903	.0045081
_cons	1.14741	.5741858	2.00	0.046	.0190049	2.275815

Appendix E: Fixed Effect Regression Result (ROA)

```
Fixed-effects (within) regression               Number of obs      =       462
Group variable: firm                            Number of groups   =        33

R-sq:  within  = 0.2949                         Obs per group: min =        14
       between = 0.0365                                        avg =      14.0
       overall = 0.1601                                        max =        14

                                                F(9,420)           =     19.52
corr(u_i, Xb)  = -0.0599                        Prob > F           =    0.0000
```

roa	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lev	-.0616141	.0125547	-4.91	0.000	-.0862921	-.0369362
lnsize	.0011901	.0051348	0.23	0.817	-.0089031	.0112833
lnage	.0065139	.0112015	0.58	0.561	-.0155041	.0285319
liqd	-.0001676	.0001297	-1.29	0.197	-.0004226	.0000873
grth	.0058616	.001192	4.92	0.000	.0035186	.0082047
temp	-.0606761	.0135499	-4.48	0.000	-.0873102	-.034042
lnrain	.1102649	.0287959	3.83	0.000	.0536629	.1668669
end	.0189025	.005541	3.41	0.001	.0080109	.0297941
fldd	-.0045199	.0046267	-0.98	0.329	-.0136142	.0045744
_cons	.9532148	.4472658	2.13	0.034	.0740565	1.832373
sigma_u	.04364882					
sigma_e	.03821482					
rho	.56608749	(fraction of variance due to u_i)				

F test that all u_i=0: F(32, 420) = 11.97 Prob > F = 0.0000

Appendix F: Random Effect Regression Result (ROA)

```
Random-effects GLS regression                   Number of obs      =       462
Group variable: firm                            Number of groups   =        33

R-sq:  within  = 0.2879                         Obs per group: min =        14
       between = 0.3358                                        avg =      14.0
       overall = 0.2975                                        max =        14

                                                Wald chi2(9)       =    183.21
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000
```

roa	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
lev	-.0630253	.0119797	-5.26	0.000	-.0865051	-.0395456
lnsize	.011541	.0036588	3.15	0.002	.0043699	.018712
lnage	-.0074846	.0069512	-1.08	0.282	-.0211086	.0061395
liqd	-.0001918	.0001279	-1.50	0.134	-.0004424	.0000589
grth	.0053694	.0011938	4.50	0.000	.0030297	.0077092
temp	-.0669262	.0132258	-5.06	0.000	-.0928482	-.0410042
lnrain	.1032124	.0286821	3.60	0.000	.0469965	.1594282
end	.0187453	.0055932	3.35	0.001	.0077828	.0297078
fldd	-.0055924	.0046064	-1.21	0.225	-.0146207	.0034359
_cons	.9941979	.4439473	2.24	0.025	.1240773	1.864319
sigma_u	.03313135					
sigma_e	.03821482					
rho	.42910921	(fraction of variance due to u_i)				

Appendix G: LM Test (ROA)

```
Breusch and Pagan Lagrangian multiplier test for random effects

        roa[firm,t] = Xb + u[firm] + e[firm,t]

        Estimated results:
                     |       Var     sd = sqrt(Var)
             ---------+------------------------------
                 roa |    .0037807       .0614871
                   e |    .0014604       .0382148
                   u |    .0010977       .0331314

        Test:   Var(u) = 0
                             chibar2(01) =   505.04
                          Prob > chibar2 =   0.0000
```

Appendix H: Hausman Test (ROA)

	Coefficients (b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
lev	-.0616141	-.0630253	.0014112	.004143
lnsize	.0011901	.011541	-.0103509	.003673
lnage	.0065139	-.0074846	.0139985	.0089212
liqd	-.0001676	-.0001918	.0000241	.0000282
grth	.0058616	.0053694	.0004922	.0001529
temp	-.0606761	-.0669262	.0062501	.0034986
lnrain	.1102649	.1032124	.0070525	.004756
end	.0189025	.0187453	.0001572	.0001194
fldd	-.0045199	-.0055924	.0010725	.0007762

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(5) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 13.50
Prob>chi2 = 0.0191
(V_b-V_B is not positive definite)

Appendix I: Fixed Effect with Robust Standard Error (ROA)

```
Fixed-effects (within) regression               Number of obs      =       462
Group variable: firm                            Number of groups   =        33

R-sq:  within  = 0.2949                         Obs per group: min =        14
       between = 0.0365                                        avg =      14.0
       overall = 0.1601                                        max =        14

                                                F(9,32)            =      9.38
corr(u_i, Xb)  = -0.0599                        Prob > F           =    0.0000

                                              (Std. Err. adjusted for 33 clusters in firm)
------------------------------------------------------------------------------
             |               Robust
         roa |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         lev |  -.0616141   .0235918    -2.61   0.014    -.1096691   -.0135591
      lnsize |   .0011901   .0067148     0.18   0.860    -.0124874    .0148677
       lnage |   .0065139   .0205584     0.32   0.753    -.0353622      .04839
        liqd |  -.0001676    .000093    -1.80   0.081    -.0003572    .0000219
        grth |   .0058616   .0023567     2.49   0.018     .0010611    .0106622
        temp |  -.0606761   .0109207    -5.56   0.000    -.0829208   -.0384315
      lnrain |   .1102649     .02326     4.74   0.000     .0628858    .157644
         end |   .0189025   .0049221     3.84   0.001     .0088766    .0289285
        fldd |  -.0045199   .0038001    -1.19   0.243    -.0122605    .0032207
       _cons |   .9532148   .2730495     3.49   0.001     .3970312    1.509398
-------------+----------------------------------------------------------------
     sigma_u |  .04364882
     sigma_e |  .03821482
         rho |  .56608749   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

Appendix J: Pooled OLS Regression Result (ROE)

Source	SS	df	MS		
Model	1.84242118	9	.204713465	Number of obs	462
Residual	10.7710123	452	.023829673	F(9, 452)	8.59
				Prob > F	0.0000
Total	12.6134335	461	.027361027	R-squared	0.1461
				Adj R-squared	0.1291
				Root MSE	.15437

roe	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lev	-.0728496	.0339645	-2.14	0.032	-.1395976	-.0061016
lnsize	.0465579	.0063453	7.34	0.000	.034088	.0590277
lnage	-.0221599	.0106482	-2.08	0.038	-.043086	-.0012338
liqd	-.0001873	.0004255	-0.44	0.660	-.0010236	.000649
grth	.0046803	.0046148	1.01	0.311	-.0043888	.0137495
temp	-.1420386	.0502115	-2.83	0.005	-.2407156	-.0433616
lnrain	.0573879	.112161	0.51	0.609	-.1630339	.2778097
end	.0313974	.0223624	1.40	0.161	-.0125497	.0753445
fldd	-.0205782	.0180509	-1.14	0.255	-.0560524	.014896
_cons	2.550653	1.740096	1.47	0.143	-.8690287	5.970334

Appendix K: Fixed Effect Regression Result (ROE)

```
Fixed-effects (within) regression               Number of obs      =       462
Group variable: firm                            Number of groups   =        33

R-sq:  within  = 0.0679                         Obs per group: min =        14
       between = 0.2156                                        avg =      14.0
       overall = 0.0946                                        max =        14

                                                F(9,420)           =      3.40
corr(u_i, Xb)  = -0.1273                        Prob > F           =    0.0005
```

roe	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lev	-.1205925	.0493651	-2.44	0.015	-.2176258	-.0235591
lnsize	.0316048	.0201901	1.57	0.118	-.0080815	.0712911
lnage	.0099289	.0440442	0.23	0.822	-.0766457	.0965035
liqd	.0003678	.00051	0.72	0.471	-.0006347	.0013703
grth	.0097619	.004687	2.08	0.038	.000549	.0189748
temp	-.1423884	.0532781	-2.67	0.008	-.2471134	-.0376634
lnrain	.0493163	.1132251	0.44	0.663	-.1732421	.2718747
end	.0330525	.0217873	1.52	0.130	-.0097732	.0758782
fldd	-.0226571	.0181919	-1.25	0.214	-.0584158	.0131015
_cons	2.805377	1.758643	1.60	0.111	-.651462	6.262215
sigma_u	.06630791					
sigma_e	.15026013					
rho	.16299403	(fraction of variance due to u_i)				

F test that all u_i=0: F(32, 420) = 1.78 Prob > F = 0.0063

Appendix L: Random Effect Regression Result (ROE)

```
Random-effects GLS regression                   Number of obs      =       462
Group variable: firm                            Number of groups   =        33

R-sq:  within  = 0.0607                         Obs per group: min =        14
       between = 0.5005                                        avg =      14.0
       overall = 0.1456                                        max =        14

                                                Wald chi2(9)       =     63.24
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000
```

roe	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
lev	-.0786776	.0364717	-2.16	0.031	-.1501608	-.0071945
lnsize	.0465054	.0073029	6.37	0.000	.0321919	.0608189
lnage	-.0226812	.0123789	-1.83	0.067	-.0469434	.0015811
liqd	-.0000775	.0004414	-0.18	0.861	-.0009427	.0007877
grth	.0059206	.0045795	1.29	0.196	-.0030549	.0148962
temp	-.1425393	.0495959	-2.87	0.004	-.2397456	-.0453331
lnrain	.0568942	.110511	0.51	0.607	-.1597033	.2734918
end	.0320251	.0219713	1.46	0.145	-.0110378	.075088
fldd	-.0210077	.0177729	-1.18	0.237	-.0558419	.0138264
_cons	2.569309	1.713002	1.50	0.134	-.7881146	5.926732
sigma_u	.02714813					
sigma_e	.15026013					
rho	.03161127	(fraction of variance due to u_i)				

Appendix M: LM Test (ROE)

```
Breusch and Pagan Lagrangian multiplier test for random effects

        roe[firm,t] = Xb + u[firm] + e[firm,t]

        Estimated results:
                         |       Var     sd = sqrt(Var)
                ---------+------------------------------
                     roe |     .027361       .1654117
                       e |    .0225781       .1502601
                       u |     .000737       .0271481

        Test:   Var(u) = 0
                                  chibar2(01) =     5.24
                               Prob > chibar2 =   0.0110
```

Appendix N: Hausman Test (ROE)

	Coefficients (b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
lev	-.1205925	-.0786776	-.0419148	.0339377
lnsize	.0316048	.0465054	-.0149006	.0190222
lnage	.0099289	-.0226812	.0326101	.0426909
liqd	.0003678	-.0000775	.0004454	.0002647
grth	.0097619	.0059206	.0038413	.0011844
temp	-.1423884	-.1425393	.000151	.020767
lnrain	.0493163	.0568942	-.0075779	.0290548
end	.0330525	.0320251	.0010274	.00085
fldd	-.0226571	-.0210077	-.0016494	.0046032

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(5) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 13.11
Prob>chi2 = 0.0224
(V_b-V_B is not positive definite)

Appendix O: Fixed Effect with Robust Standard Error (ROE)

```
Fixed-effects (within) regression               Number of obs      =       462
Group variable: firm                            Number of groups   =        33

R-sq:  within  = 0.0679                         Obs per group: min =        14
       between = 0.2156                                        avg =      14.0
       overall = 0.0946                                        max =        14

                                                F(9,32)            =     11.59
corr(u_i, Xb)  = -0.1273                        Prob > F           =    0.0000

                                          (Std. Err. adjusted for 33 clusters in firm)
```

roe	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
lev	-.1205925	.1712042	-0.70	0.486	-.469324	.228139
lnsize	.0316048	.0223794	1.41	0.168	-.0139805	.0771901
lnage	.0099289	.0598406	0.17	0.869	-.1119625	.1318203
liqd	.0003678	.0001867	1.97	0.058	-.0000125	.0007482
grth	.0097619	.0053606	1.82	0.078	-.0011572	.020681
temp	-.1423884	.0556903	-2.56	0.016	-.2558258	-.028951
lnrain	.0493163	.1141862	0.43	0.669	-.1832733	.2819059
end	.0330525	.0137471	2.40	0.022	.0050506	.0610544
fldd	-.0226571	.0124819	-1.82	0.079	-.0480819	.0027676
_cons	2.805377	1.638164	1.71	0.096	-.5314553	6.142208
sigma_u	.06630791					
sigma_e	.15026013					
rho	.16299403	(fraction of variance due to u_i)				

Appendix P: Pooled OLS Regression Result (Tobin's Q)

Source	SS	df	MS		
Model	27.827355	9	3.09192833	Number of obs	462
Residual	97.2495183	452	.215153802	F(9, 452)	14.37
				Prob > F	0.0000
Total	125.076873	461	.271316428	R-squared	0.2225
				Adj R-squared	0.2070
				Root MSE	.46385

tq	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lev	.6027883	.1020566	5.91	0.000	.402224	.8033526
lnsize	.1584833	.0190662	8.31	0.000	.1210138	.1959527
lnage	-.0018404	.0319957	-0.06	0.954	-.0647191	.0610384
liqd	.0002649	.0012786	0.21	0.836	-.0022479	.0027778
grth	-.0089022	.0138666	-0.64	0.521	-.0361532	.0183488
temp	-.2234428	.1508756	-1.48	0.139	-.5199474	.0730618
lnrain	.1361081	.3370214	0.40	0.687	-.5262151	.7984313
end	-.0315762	.0671944	-0.47	0.639	-.1636284	.100476
fldd	.0484419	.0542395	0.89	0.372	-.058151	.1550347
_cons	2.658591	5.228638	0.51	0.611	-7.616865	12.93405

Appendix Q: Fixed Effect Regression Result (Tobin's Q)

```
Fixed-effects (within) regression               Number of obs      =       462
Group variable: firm                            Number of groups   =        33

R-sq:  within  = 0.2053                         Obs per group: min =        14
       between = 0.1716                                        avg =      14.0
       overall = 0.0235                                        max =        14

                                                F(9,420)           =     12.05
corr(u_i, Xb)  = -0.6937                        Prob > F           =    0.0000
```

tq	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lev	.8116774	.1013326	8.01	0.000	.6124952	1.01086
lnsize	-.2420246	.0414446	-5.84	0.000	-.3234893	-.1605599
lnage	.1773604	.0904104	1.96	0.050	-.0003529	.3550737
liqd	-.0000253	.0010469	-0.02	0.981	-.0020831	.0020326
grth	-.0010324	.0096211	-0.11	0.915	-.0199439	.0178792
temp	.202823	.109365	1.85	0.064	-.0121479	.417794
lnrain	.7031748	.2324192	3.03	0.003	.2463251	1.160025
end	-.0224261	.0447231	-0.50	0.616	-.1103352	.0654829
fldd	.1383088	.0373429	3.70	0.000	.0649064	.2117111
_cons	-4.172191	3.609999	-1.16	0.248	-11.26811	2.923725
sigma_u	.59461493					
sigma_e	.30844174					
rho	.78797498	(fraction of variance due to u_i)				

```
F test that all u_i=0:     F(32, 420) =    18.82                 Prob > F = 0.0000
```

Appendix R: Random Effect Regression Result (Tobin's Q)

```
Random-effects GLS regression                   Number of obs      =       462
Group variable: firm                            Number of groups   =        33

R-sq:  within  = 0.1801                         Obs per group: min =        14
       between = 0.0121                                        avg =      14.0
       overall = 0.0094                                        max =        14

                                                Wald chi2(9)       =     76.30
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000
```

tq	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
lev	.7746215	.1016031	7.62	0.000	.575483	.9737599
lnsize	-.0861563	.0332256	-2.59	0.010	-.1512774	-.0210353
lnage	.0280269	.0650141	0.43	0.666	-.0993983	.1554521
liqd	.0000564	.0010735	0.05	0.958	-.0020475	.0021604
grth	-.0051983	.0099624	-0.52	0.602	-.0247241	.0143276
temp	.0769819	.1111068	0.69	0.488	-.1407834	.2947471
lnrain	.5538384	.2396917	2.31	0.021	.0840514	1.023625
end	-.0242704	.0465855	-0.52	0.602	-.1155762	.0670354
fldd	.1139818	.0384968	2.96	0.003	.0385295	.1894341
_cons	-2.698362	3.711611	-0.73	0.467	-9.972985	4.576262
sigma_u	.33485223					
sigma_e	.30844174					
rho	.540986	(fraction of variance due to u_i)				

Appendix S: LM Test (Tobin's Q)

```
Breusch and Pagan Lagrangian multiplier test for random effects

        tq[firm,t] = Xb + u[firm] + e[firm,t]

        Estimated results:
                         |       Var     sd = sqrt(Var)
                ---------+------------------------------
                      tq |    .2713164       .5208804
                       e |    .0951363       .3084417
                       u |     .112126       .3348522

        Test:   Var(u) = 0
                                 chibar2(01) =   581.14
                              Prob > chibar2 =   0.0000
```

Appendix T: Hausman Test (Tobin's Q)

	Coefficients (b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
lev	.8116774	.7746215	.0370559	.0286684
lnsize	-.2420246	-.0861563	-.1558683	.027575
lnage	.1773604	.0280269	.1493335	.0681556
liqd	-.0000253	.0000564	-.0000817	.0001931
grth	-.0010324	-.0051983	.0041659	.0011052
temp	.202823	.0769819	.1258412	.0252447
lnrain	.7031748	.5538384	.1493364	.0343388
end	-.0224261	-.0242704	.0018442	.000862
fldd	.1383088	.1139818	.0243269	.0056185

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(5) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 40.17
Prob>chi2 = 0.0000
(V_b-V_B is not positive definite)

Appendix U: Fixed Effect with robust Standard Error (Tobin's Q)

```
Fixed-effects (within) regression               Number of obs      =       462
Group variable: firm                            Number of groups   =        33

R-sq:  within  = 0.2053                         Obs per group: min =        14
       between = 0.1716                                        avg =      14.0
       overall = 0.0235                                        max =        14

                                                F(9,32)            =      4.34
corr(u_i, Xb)  = -0.6937                        Prob > F           =    0.0009

                                        (Std. Err. adjusted for 33 clusters in firm)
```

tq	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
lev	.8116774	.2306753	3.52	0.001	.3418071	1.281548
lnsize	-.2420246	.0971193	-2.49	0.018	-.4398501	-.0441991
lnage	.1773604	.1390575	1.28	0.211	-.1058904	.4606112
liqd	-.0000253	.0010597	-0.02	0.981	-.0021838	.0021333
grth	-.0010324	.0133612	-0.08	0.939	-.0282483	.0261835
temp	.202823	.0800327	2.53	0.016	.0398018	.3658442
lnrain	.7031748	.3036704	2.32	0.027	.0846184	1.321731
end	-.0224261	.0356541	-0.63	0.534	-.0950512	.0501989
fldd	.1383088	.0452804	3.05	0.005	.0460757	.2305419
_cons	-4.172191	3.09203	-1.35	0.187	-10.47045	2.126068
sigma_u	.59461493					
sigma_e	.30844174					
rho	.78797498	(fraction of variance due to u_i)				