The Cost of Climate Adaptation for the Listed Companies in the Stock Market

MD. MAHMUDUL ALAM
Associate Professor
School of Economics, Finance & Banking
Universiti Utara Malaysia
Sintok, Kedah, Malaysia

Adaptation Finance Fellowship Programme (AFFP) 2018/2019
Thailand Development Research Institute (TDRI)
Frankfurt School of Finance and Management (FS-UNEP Centre)

March 2020

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LIST OF ABBREVIATIONS

ASE	Athens Stock Exchange
BOM	Australian Government Bureau of Meteorology
DCF	Discounted cash flow
DSM	Department of Statistics Malaysia
DYIELD	Dividend Yield
EBIT	Earnings Before Interest and Taxes
ELN	El Nino
EMH	Efficient Market Hypothesis
ENSO	El Nino Southern Oscillation
ETP	Malaysian Economic Transformation Program
EVOL	Earnings Volatility
FAO	Food Agricultural Organization
FFB	Fresh Fruit Bunch
FLD	Flood
GDP	Gross Domestic Product
IPCC	Inter-governmental Panel on Climate Change
JMA	Japanese Meteorological Agency
KLCI	Kuala Lumpur Composite Index
KLSE	Kuala Lumpur Stock Exchange
LM	Lagrangian Multiplier Test
MEI	Multivariate Enso Index
MPOC	Malaysian Palm Oil Council
NHRIM	National Hydraulic Research Institute of Malaysia
OECD	Organization for Economic Co-operation and Development
OLS	Ordinary Least Square
ONI	Oceanic Nino Index
PAYOUT	Dividend Payout Ratio
PDSI	Palmer Drought Severity Index
PVOL	Share Price Volatility
SIZE	Market Value
SOI	Southern Oscillation Index
SSM	Suruhanjaya Syarikat Malaysia
UNFCCC	United Nations Framework Convention on Climate Change
USA	United States of America

ACKNOWLEDGEMENT

I, Md Mahmudul Alam, would like to acknowledge the valuable contributions of Khadar Ahmed Dirie, Md Rabiul Karim, Nazmul Hossain, Amanda Loo Shin Chean, Nirmal Kumaar Mahindran, Yasmin Binti Mohamad Tahir, Lim Pui Yee, and Punitha Aresamy, who are the postgraduate students of Universiti Utara Malaysia (UUM), to the successful completion of this research project. I am also thankful to Bursa Malaysia, Economic and Financial Policy Institute (ECoFI) and School of Economics, Finance & Banking (SEFB) of Universiti Utara Malaysia (UUM) for facilitating and supporting the project.

I am also thankful to Dr. Nipon Poapongsakorn from TDRI, Prof. Dr. Ulf Moslener from FS-UNEP Centre, Dr. Bhim Adhikari from IDRC, and other fellows and training facilitators of AFFP for their valuable comments for the improvement of the research project. A very special thanks goes to the coordinators from FS-UNEP Centre and TDRI, especially Mr. Jonas Hernán Fleer, Dr. Christine Grüning, and Ms. Nipa. Last but not the least, I acknowledge TDRI, FS-UNEP Centre and IDRC for awarding me with the research grant to carry out this research project.

EXECUTIVE SUMMARY

Climate change is an important factor that directly affects in the agriculture. Therefore, to adapt with the climate change, agriculture and plantation firms need to take different initiatives and spend in many ways. If the firm is enlisted as a public listed company, it needs to bear adaptation cost in physical level, accounting level and stock market level. In the stock market, investors expect risk premium in order to accept the higher fluctuation or volatility of the stock price. As climatic events have direct adverse impacts on the financial performance of agro and plantation companies, it also increases the business risk for these companies. Therefore, to maintain stability in price, higher equity market risk premium and/or higher dividend is required. This extra risk premium and extra cost of equity, dividend, can be considered as the climate change adaptation cost at stock market level. This cost helps agro and plantation companies to maintain performance at stock market level. Therefore, to understand the climate change adaptation cost for stock market performance of public listed agro and plantation companies in Malaysia, this study empirically investigate four specific objectives – (i) examine the impact of climate change on stock market price volatility (market risk), (ii) find out the equity market risk premium (market return) for climate change events, (iii) examine the impact of climate change on the cost of equity (dividend), and (iv) find out the reflection of climate change on the stock market investor's behavior. To fulfill the first and third objectives, the firm level data were collected for 33 Malaysian public listed plantation companies from 2003 to 2016. For the climatic variables, both models considered El Nino and Flood, and panel regression models were used to draw inferences. For the second objective, this study conducted event study based on El Nino events that happened from 2009 to 2018. The firm level daily stock price data for 37 companies, market index data, plantation index data, and El Nino data were analyzed to determine risk, return and risk premium for the El Nino events. To fulfill the fourth objectives, a structured questionnaire survey was conducted among the individual investors in Malaysian Stock Market, Bursa Malaysia. To draw inferences this study estimated Structural Equation Model based on 273 samples. The overall findings show that climatic events are long term phenomenon which has not adequate and significant instant impact on the stock price or market return. However, investors are aware about the negative impacts of climate change on the annual return of the company, and they expect compensation for the climatic risk. Therefore, public listed companies compensate the investors through providing higher dividend in the adverse climatic event year and it also help them to maintain stability in stock price. The findings of the study will help the investors, companies, regulatory agency and policy maker to improve the market efficiency and to achieve the UN target of sustainable stock exchange initiatives.

Keywords: Stock price volatility; Stock market return; Cost of equity; Dividend payout; Investor's behavior; El Nino; Flood; Plantation company; Bursa Malaysia

1. INTRODUCTION

1.1 Research Background

According to the UNFCCC, climate finance is defined as the fund used to decrease emissions, improve sinks of ozone depleting substances and diminish vulnerability of, as well as the upsurge of the resilience of human and ecological systems to harmful climate change impacts (UNFCCC, 2014). Most of the researchers have found that climate change affects agricultural production and crop yield (e.g. Alam et al., 2011; Rosenzweig et al., 2002; Kurukulasuriya & Rosenthal, 2003; Ibrahim & Alam, 2016). Some studies have addressed temperature and rainfall impacts on major crops and palm oil (Baker & Allen, 1993; Paterson et al., 2013, 2015; Shabani et al., 2012). El Nino phenomenon is the most potential source of climatic variability, which is associated with droughts and floods that could be a reason of less productivity in agro-based companies or declining in country's overall economic health (Berry & Kozaryn, 2008; Kovats et al., 2003; Cashin et al., 2017). Flood is another climatic phenomenon, which can occur suddenly and cause for hazards, such as damage to agricultural production and infrastructure, landslides, mud flows, and even death (Collier, 2007; Piao et al., 2010).

Therefore, climate change is considered to be an important factor that affects the performance of agro and plantation companies. However, declining in crops production would be one of the reasons of declining firm's profitability, which is supposed to increase the volatility of stock price. According to the Efficient Market Hypothesis (EMH), the information of climate change is supposed to be reflected in the price of the related companies in the capital market. Based on the risk of the climate change, there should be a risk premium for commodities, and the risk premium is supposed to be reflected in prices and volatility. However, only little is known on this issue in literature.

It would appear that the climate change has direct impacts on the financial industry and insurances through property damages (Davey et al., 2011). However, this impact tends to be underappreciated by the market. In 2014, the pricing for soft commodities indicated that the market was only pricing in a 20% probability despite meteorologists' predicting a 60–70% probability of El Nino occurring (Stathers, 2015). More studies show that El Nino has substantial effect over the financial markets and derivatives markets over the world for Soft commodities, like Rice, Wheat, Sugarcane, Soya bean, Brunt Oil, etc., and Hard commodities like Gold, Copper, etc. (Periasamy & Satish, 2016). Another study has shown that there is an impact of natural disasters on the composite stock market in Japan, but not any impact is found in the context of the US (Wang & Kutan, 2013). Worthington (2008) observes no significant impact from disasters on the Australian stock market. In addition, Luo (2012) finds 'surprisingly' small and insignificant effects on six distinct national stock market indices, and Asongu (2013) finds no evidence of spill-over in international foreign exchange markets. On the other hand, Worthington and Valadkhani (2004) observe significant abnormal returns on the Australian stock market, and Bourdeau-Brien and Kryzanowski (2017) have found that catastrophes have a significant impact on returns in US market, but the second moments of local stock returns more than double when hurricanes, floods, winter storms and episodes of extreme temperature occur. All of these studies are conducted, focusing on the overall market indexed.

However, there are no empirical study on the companies that has direct link with climate change, which is ultimately linked with climate change adaptation finance of the respective companies. Climate finance is the broadest form that represents the fund that being used to all projects and activities that support climate mitigation and climate adaptation. Adaptation finance is the fund that supports to implement the adaptation actions towards the negative impacts of the changes of climate. There are various types of adaptation finance tools that can be used to reduce the risk and income loss due to the adverse climatic impacts, namely, equity market risk premium, crop sharing, insurance, future options, income stabilization programs by the government (Alam et al., 2010).

In case of public limited agro or plantation company, firms need to spend money in three stages for the climate change adaptation. At the very initial stage, they need to spend money for core infrastructural and physical adaptation, such as changing production techniques and approaches, upgrading the stakeholders' knowledge (i. e. producers, labors, storage, packaging, etc.), infrastructural changes, innovation, etc. Secondly, they need to bear the cost of maintaining financial performance or profitability, such as change or adjustment in the accounting system, maintain extra reserve fund, more insurance payment, high cost of borrowing, diversify asset portfolio, etc. Finally, since the goal of firm manager is to maximize shareholder wealth by maintaining stock price stability in market, these companies must ensure extra risk premium or pay extra cost of equity by paying more dividend.

As measuring the first two types of cost related to the adaptation is in great magnitude in nature, the scope of the research is limited to only for the third option to measure the adaptation finance related to the equity market risk premium and extra cost of equity only. The equity market risk premium is the average return that stockholders require in order to accept the higher fluctuation of the stock price that affects their returns (Harper, 2017). The changes of the climate in global has become the risk for investor to invest in relevant companies; therefore, the equity market risk premium is required for the compensation related to the higher risk and huge volatility of the equity (Murray, 2015; Bhadada, 2015). Furthermore, due to the climate changes, the plantation companies get into more risky business, and the probability in failing the business is increasing in the long run; hence, the stock prices are lower when the higher equity market risk premium is required or higher dividend is required. This extra risk premium and extra cost of equity are the cost of adaptation. By spending this cost, plantation companies can maintain stock market performance. To finance this extra risk premium and extra dividend, companies need to follow different approaches, which are mostly related the initial two stages of adaptation cost, such as diversifying asset portfolio, spending from special reserve fund, distributing more dividend and investing less, etc.

1.2 Research Questions

The overall objective of this study is to examine the adaptation cost of climate change, especially in case of the El Nino and flood, for stock market performance of public listed agro and plantation companies in Malaysia.

The following specific questions will answer the above objective:

1. what is the impact of climate change, such as El Nino and flood, on stock market price volatility (market risk) of Malaysian agro and plantation companies?

2. What are the equity market risk premium (market return) of agro and plantation companies enlisted in Bursa Malaysia for climate change event, like El Nino?

3. What are the impacts of climate change, such as El Nino and flood, on the cost of equity (dividend) of Malaysian agro and plantation companies?

4. What are the reflections of climate change on stock market investor's decision to invest in climate change affected companies?

1.3 Research Objectives

The overall objective of this project is to examine the stock market adaptation cost of climate change, especially for El Nino and flood, through measuring the equity market risk premium and extra cost of equity (dividend) bearing by Malaysian public listed agro and plantation companies. The specific objectives are as given below:

- To examine the impact of climate change, such as El Nino and flood, on stock market price volatility (market risk) of Malaysian agro and plantation companies.

- To find out the equity market risk premium (market return) of agro and plantation companies in Bursa Malaysia for climate change event, like El Nino.

- To examine the impact of climate change, such as El Nino and flood, on the cost of equity (dividend) of Malaysian agro and plantation companies.

- To find out the reflection of climate change, such as El Nino and flood, on the stock market investor's behavior related to agro and plantation companies in Malaysia.

1.4 Organization of the Report

This report contains five sections, and the first section focuses on the background and objective of the study. The second section reviews Malaysian plantation and agricultural sector link with climate change and stock market. The third section reviews the literature and relevant development of hypotheses. The fourth section explains the methodology and model design of the study. Section five covers the analysis of the results and discussions of the study. The final section highlights the conclusion of the study and provides policy recommendation with the remarks for the scope of future research.

2. MALAYSIAN AGRICULTURE, CLIMATE CHANGE AND STOCK MARKET

This section gives a brief discussion on agricultural contribution in economy, its relationship with climate change, and the performance of relevant public listed companies in stock market.

2.1 Overview of Malaysian Agriculture Sector

Malaysia's geographical area and tropical climate provide Malaysia a wide range of agriculture resources like palm oil, rubber, paddy, kenaf, cocoa and others raw materials to export. Agriculture sector stands a significant role in Malaysia economy and palm oil is the main product that contributed the most to the GDP growth rate as Malaysia generates more revenues from exporting of palm oil to other countries. In 2015, the ranking of Malaysia as a palm oil producer in the world is second largest behind Indonesia which the amount of palm oil was produced was 19.9 million tonnes whereas Indonesia able produced more 13.5 tonnes palm oil than Malaysia to the world, which was 33.4 million tonnes and stands as the largest global palm oil producer (Green Palm, 2016).

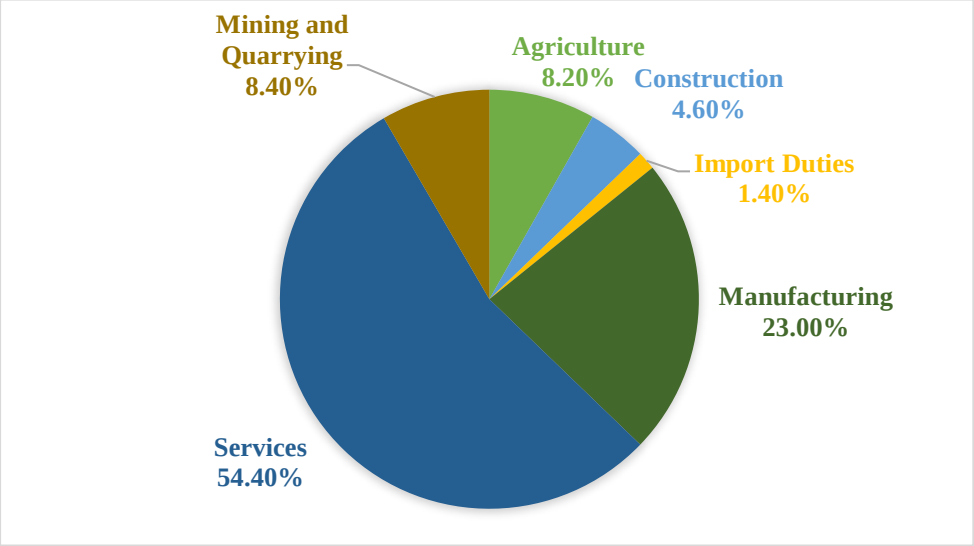

Figure 2.1: Sectoral Contribution to GDP in Malaysia: 2017
Source: Bank Negara Malaysia and Department of Statistics Malaysia, 2017

Figure 2.1 illustrations the measurement of share of different sectors to Malaysia's GDP in percentage such as agriculture, construction, import duties, manufacturing, services as well as mining and quarrying in 2017. The total GDP of Malaysia in 2017 is RM 1,173.6 billion and services sector is the major sector that contributes 54.4 percent of the total GDP. Second large sector is manufacturing which contributes 23 percent. Agriculture sector contributes 8.2 percent to the GDP in 2017 which is also a significant part to the national economy.

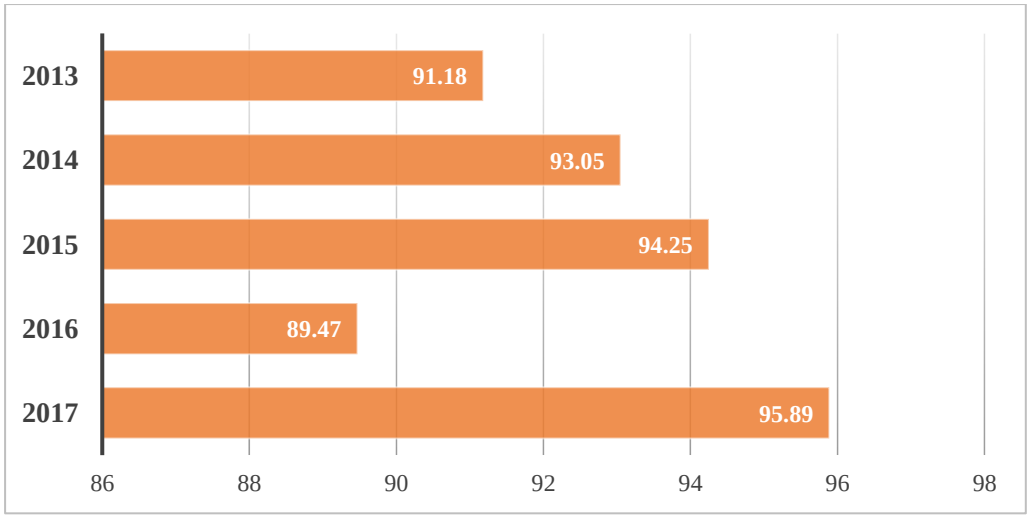

Figure 2.2: Malaysian GDP Contribution (Billion RM) by Agriculture Sector: 2013-2017
Source: Bank Negara Malaysia and Department of Statistics Malaysia, 2017

Figure 2.2 illustrates the GDP contribution by agriculture sector in Malaysia in absolute amount for the recent five years. The amount of sharing to the GDP was increasing from year 2013 to year 2015 by 3.37 percent to RM 94.25 billion but it has decreased approximately RM 4.78 billion of GDP in 2016 to RM 89.47 billion. However, it has increased back 7.18 percent in 2017 which was in total of RM 95.89 billion.

Based on Department of Statistics Malaysia (2016), agriculture sector's exports and imports amounted to RM115,844 million and RM84,673 million. Thus, the balance of trade amounted to RM31,172 million. As compared to year 2015, exports and imports increased by 5.4 per cent and 0.9 per cent respectively in year 2016. In addition, agriculture sector creates a huge job opportunity for people whereby 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).

2.2 Malaysian Agriculture and Climate Change

Agriculture and climate are interdependent. Plants are the primary factories of agriculture. Plants take in carbon dioxide from the air through their leaves. They take in moisture and chemical substances from the soil through their roots. Out of these, plants make seeds, fruits, fibers, and oils that man can use by using the energy of the sunlight. Animals, on the other hand, depend on plants for their food; they can eat many parts of plants that man does not, such as stems and leaves of grasses.

Malaysia is one of the countries in Southeast Asia that exposed to El Nino effect, which will experience deficit of rainfalls in the dry season. In an assessment by the UNFCCC and World Health Organisation (WHO) in 2015, Malaysia was said to confront various potential threats to health and development due to climate change. Impact of extreme climate can be seen in the perspective of socio-economic development such as GDP, industries, agriculture land use, production and consumption patterns (Jabin, 2015). For Malaysia, 10% Gross domestic product

(GDP) was attributable to agriculture sector (Department of Statistics Malaysia Official Portal, 2018). Crude palm oil contributed to the largest agricultural yield in Malaysia. It is also influenced by weather condition. (Ho, 2018)

For many decades, the Malaysian climate has been fairly stable and predictable. However, for the last twenty years, there was a more frequent and rampant abnormal climate variation. Parker (1997) has noted that Malaysia is often hit by floods, droughts, landslides, haze, tsunami and human-made disasters even though Malaysia is away from the Pacific Ring of Fire. This was brought up predominantly by El Nino induced weather variability, which brought serious implications on all economic sectors, including that of agriculture and the rural economy.

Since 1950, there were twelve major El Nino events recorded in the country. During the same period, seven La-Nina events were also recorded. The worst El Nino event affecting the country was the 1997/98 event, which began in March 1997 and continued until June 1998. The most critical event was the El Nino related droughts, which caused extensive percussion on the society as well as the environment across the country. Long term dry conditions threaten many parts of the nation. The disaster took place in the states of Selangor, Sarawak and Sabah. Sabah was probably the state most seriously affected by the drought of 1998 (Austin & Baharuddin, 2012).

Overall, the immediate effect of all El Nino episodes was the delay in the monsoon rains, which resulted in abnormally dry weather for most parts of the country. In the past few years, the prolonged drought encouraged forest fires, and the resultant pollution (in the form of haze or smoke) remained airborne due to little rain to 'wash' it away. Many of these fires were set deliberately by plantation firms and timber companies to clear land, since this was considered the cheapest and the most practical method for land preparation. The practice of shifting cultivation by small farmers aggravated the problem further. The resultant pollutants produced a far greater impact with respect to severe deterioration in air quality, which was more detrimental than that of drought alone.

Flood is another common phenomenon in Malaysia due to the climate change. Table 2.1 shows that the major flood history in Malaysia. In year 2000, floods happened in Kelantan and Terengganu. Where else in year 2004, Penang was heavily affected by tsunami and in year 2006, 2007 and in 2008, Johor faced floods. Further in year 2010, Kedah and Perlis also faced flood issues. It reveals that flood do frequently happen in the same area and thus affects the crops frequently (Worthington, 2008). As per Malaysian Palm Oil Council (MPOC) (2018), oil palm trees are planted in estates around some states of Malaysia. There are a few occasions of floods that happened at the estate areas and thousands of hectares of forests were destroyed (Diya et al, 2014).

Table 2.1: Floods History in Malaysia: 1926-2016

Date/Year	Incidence	Property, Material, Crop or other losses in USD
1926	Flood known as “The storm forest flood”	Thousands of hectares of forests destroyed
December 1996	Floods brought by Tropical Storm Greg in Keningau (Sabah State)	300 million

2000	Floods caused by heavy rains in Kelantan and Terengganu	Millions
December 2004	Asian Tsunami majorly affected Penang state.	Millions
December 2006 & January 2007	Floods in Johor State	489 million
2008	Floods in Johor State	21.19 million
2010	Floods in Kedah and Perlis	8.48 million
2011 & 2012	La Nina which brought floods to various states	Millions
2013 & 2014	Flash floods in Sabah and Perak	Millions
2015	Floods caused by heavy rains in Kelantan, Terengganu, Pahang and Perak.	300 Millions
2016	Inland floods in Sarawak	Millions

Source: Diya et al (2014); FloodList.com (2018)

The impact of flood can be categorized as direct and indirect as well as primary and secondary. Moreover, flood disasters have an impact on the psychology of the victims, the socio-economy and food security. According to Tuan Pah Rokiah (2011), the psychological impact suffered by flood victims is not only profound and prolonged, but its effects are worse than those of the economic impact. As the rainy season comes every year, it makes the flood victims in Kelantan Stare of Malaysia feel uneasy and unsafe. Even though flood is accepted as normal by the people who live in Kelantan, this normalcy may become abnormally disastrous as it did in the 2014 flood disaster, which was unexpectedly unusual. Ahmad (2015) observed that Kelantan flood in 2014 had exposed multiple risks to the Kelantan's people which were impacted physically, socially, economically and psychologically. In similar vein, Paranjonthy et al. (2011) have noted that that flood may lead to a wide range of psychosocial and mental health impacts, including distress, anxiety, depression and posttraumatic stress disorder. Moreover, the impacts of flood include damages to homes, shops and industries, especially the agricultural sector (Vinet, 2008). In addition, from the perspective of economy, floods have caused losses worth billions to Malaysia (Low & Ahmad Jamaluddin, 2001). Flood is also a big threat for food security because due to flood people face difficulties and damages in terms of disrupted agricultural activities, lack of road accessibility, food insufficiency and losses of properties.

2.3 Stock Market Performance of Malaysian Agro and Plantation Companies

According to the Malaysian Economic Transformation Program (ETP) (2014), Plantation sector serves as an essential sector whereby it aims to contribute to the sustainability and economic growth through transforming a production-based sector and traditionally small-scale businesses into a large-scale agribusiness. Rubber, palm oil, paddy and cocoa are the key crops in the plantation sector. Apart from that, rubber and palm oil are the two main products that always contribute to the growth rate of GDP. A huge income is being generated by Malaysia through exporting rubber and palm oil to other nations (Department of Statistics Malaysia (DSM), 2016). According to Bank Negara Malaysia (2011-2020), as Malaysia improves its investment linkages and trades within the region and internationally, the financial industry has an essential role in supporting the developments of other Malaysian companies and facilitating productive investment flows.

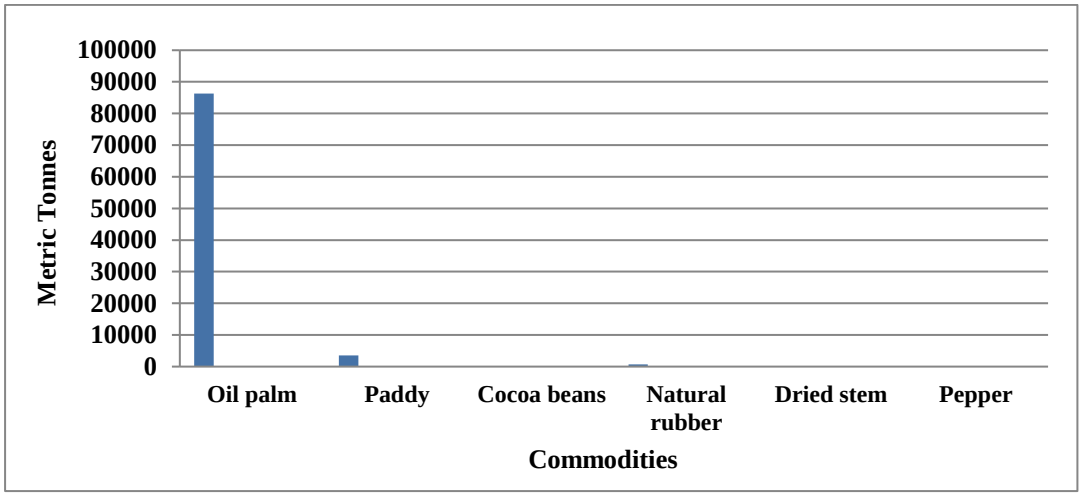

Figure 2:3: Malaysian Production of Plantation by Sub-Sector: 2016
Source: Department of Statistics Malaysia, 2016

Figure 2.3 shows the amount of oil palm, paddy, cocoa beans, natural rubber, dried stem and pepper production. Oil palm has the highest production at 86,325.3 metric tones and cocoa beans have the lowest at 1.8 metric ton compared to other crops in 2016.

Table 2.2: Top Dividend Paid Shares in Malaysian Plantation Sector: 2017

No.	Name of Stock	Dividend per share (RM)	Share Price before 4 days of dividend payment (RM)	Share Price on actual day of dividend payment (RM)	Share Price after 4 days of dividend payment (RM)
1	Batu Kawan	0.4	19.34	19.5	19.42
2	Kuala Lumpur Kepong	0.35	24.4	24.5	24.8
3	Far East Holdings	0.2	8.68	8.6	8.6
4	United Plantation	0.2	28.36	28.4	27.8
5	United Malacca	0.12	6.26	6.25	6.38
6	Chin Teck Plantation	0.1	7.8	7.9	8
7	Genting Plantation	0.08	11.14	11.12	11.08
8	Hap Seng Plantation	0.08	2.62	2.62	2.62
9	Kim Loong Resources	0.08	3.94	3.9	3.88
10	Boustead Plantation	0.07	1.64	1.64	1.65

Source: Investing.com (2018)

Agro and Plantation companies are also performing very good in the Malaysian stock market (Bursa Malaysia). These companies also provide competitive dividends. Dividend payment (announcement) has also found mixed relationship with share price of these companies. According to Table 2.2, Genting Plantation Berhad's share price

before dividend payment was at RM11.14 and after the dividend payment, the share price dropped to RM11.08. Then, looking at Kuala Lumpur Kepong Berhad, the company shows a positive relationship between share price and dividend whereby on the actual day of dividend payment, the share price rised to RM24.5 from RM24.4 and after the dividend payment, the share price also raised slightly higher to RM24.8. Other than that, Hap Seng Plantation Berhad's share price portrays no positive or negative changes before and after the dividend payment, whereby the share price stays at a rate of RM2.62. Similarly, for the agro and plantation companies, the share price volatility might be affected by different other relevant factors including climatic events, such as El Nino and flood, but there was no empirical study conducted on this issue before.

3. LITERATURE REVIEW

This section reviews the relevant literature under different heading and sub-heading by following the objectives of the study.

3.1 Climate and Stock Price Volatility

Climate change, this study considers El Nino and flood, has direct and indirect impacts on stock market. El Nino Southern Oscillation (ENSO) is the climate occurrence that affects the variability of the global temperature that originated in the tropical eastern Pacific Ocean which led to the climate changes in many regions such as heavy rain and severe drought (Cirino et al., 2015). Cirino et al. (2015) found that the agricultural productivity in the Notheast region of Brazil such as corn and bean suffered approximately 50 percent losses that impose the socioeconomic consequences which led to rises in food price and reducing in income. This result is supported by the finding of Selvaraju (2003) that the author discovered the significant negative relationship between food grain production and El Nino. The author analyzed the relationship by employing the data for the period 1950 to 1999 and found that the increasing in El Nino reducing the food grain production. In addition, in the study of Cashin, Mohaddes and Raissi (2017), they found that there are mixed results of the relationship between El Nino and real economic activity in different countries. There is positive relationship between El Nino and real economic activity in Argentina, Canada, China, Chile, Europe, Singapore Thailand and USA, whereas El Nino is inversely related to the real economic activity in the countries such as Australia, Brazil, Indonesia, Peru, Philippines, and South Africa.

There are few researches examine the relationship between El Nino and economy as well as between El Nino and stock market. Smith and Ubilava (2017) had examined the relationship between El Nino and economy growth by using 55 years data from year 1961 to 2015 in 69 developing countries and the authors found that there is regime-dependent nonlinear relationship between El Nino and economy growth with negative sign, where the economy growth reduced one-to-two percent with 1°C deviation increase in sea surface temperature in El Nino event. Besides, Rahman, Abdullah, Balu and Shariff (2013) found that the crude oil palm production and stock level will decrease during the El Nino event, but the crude oil palm price will increase 10.2 percent due to the shortage of production in Malaysia. In other words, there are negative relationships between El Nino and both crude oil palm production and stock level. However, there is positive relationship between El Nino and crude oil palm price. Nonetheless, there is a study conducted by Blotenburg (2017) discovered that El Nino has no impact on the stock market in some developed countries such as Australia, France, Germany, Italy, Japan, New Zealand, The Netherlands and the USA.

Based on Kovats et al (2003), El Nino is a climate event started in the Pacific Ocean whereby it is known as El Nino Southern Oscillation (ENSO). EL Nino is associated with floods and droughts which impacts the global weather. According to Pidwimy (2006) El Nino is the occasional development of warm ocean surface waters. Further, this phenomenon can lead to reduction in a country's economic health. Based on Berry and Okulicz-Kozaryn (2008), the frequent climatic variability source is the El Nino phenomenon. Furthermore, El Nino negatively impacts productivity of economy in

countries like South Africa, Brazil, Philippines, Indonesia, Australia and Peru (Cashin et al., 2017). El Nino is a factor for less productivity in plantation companies and this situation makes the companies' performance to drop (Marengo & Espinoza, 2005). When the companies' performance drops, then the share price will be affected and leads to the unfavorable fluctuation in the share price (Spiele, 2017). Besides, Kang et al (2010) obtained that change in weather such as El Nino affects the volatility of Shanghai stock market.

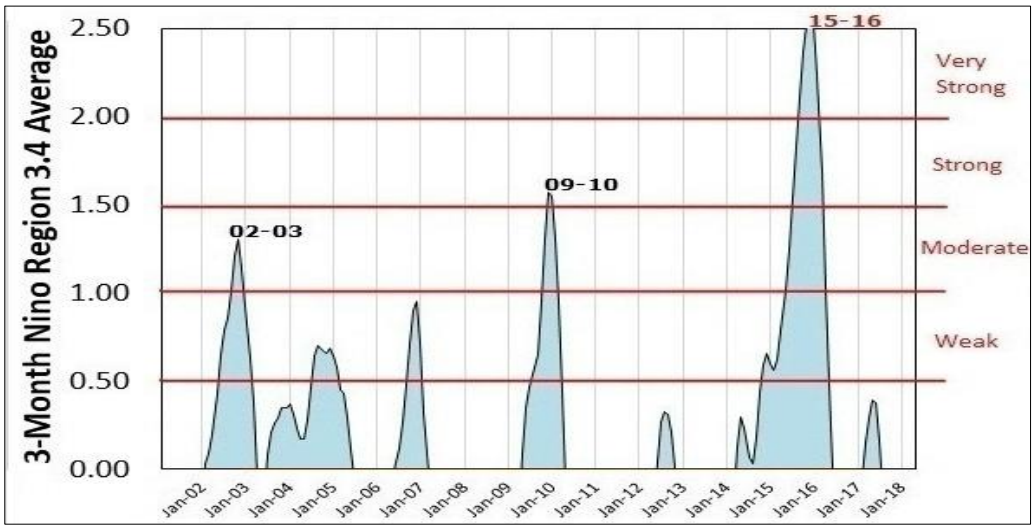

Figure 3.1: Global El Nino Event Index: 2002 – 2018
Source: Golden Gate Weather Services (2018)

Figure 3.2: Kuala Lumpur Plantation Index: 2003-2018
Source: Investing.com (2018)

Figure 3.1 depicts the evidence of El Nino events in year 2002 to 2003 (moderately), year 2009 to 2010 (strongly) and in mid-year 2014 to 2016 (very strongly). Between these events, there are a few minor El Nino events. Based on Figure 3.2, the volatility of Kuala Lumpur Plantation Index between mid-year 2014 to 2016 is between 9000 to 6800 price indexes (-2200 price index). It reveals that during the strong El Nino

event, there is a huge volatility in plantation sector. It means that El Nino does impact the share price volatility of plantation sector drastically. In addition, Yoon and Kang (2009) mentioned that low temperatures such as La Nina and high temperatures such as El Nino lead to negative returns on the Korean stock market.

Anther climatic event is flash flood which causes, hazards for instance mud flows, landslides, infrastructure damage and death (Collier, 007). Besides, flood is the natural hazard that happens suddenly and considered as the third most damaging globally after storm and earthquakes (Wilby & Keenan, 2012). Piao and others (2010) stated that flood has very direct impact on the agriculture production that can lead to the economic losses. The flood occurred in Yangtze basin has brought damage to the crops productions as well as the land and houses which incurred US$20 billion losses (Piao et al., 2010). Besides, the flooding in Somerset in south western England has damage the agricultural productions in the spring 2012. Drainage systems and field infrastructure as well as the damage of soil brought a longer period to recover and these impacts incurred huge costs and loss in revenue to the farmers as well as economic losses (Morris & Brewin, 2014).

Worthington (2008) found that the impact of flood negatively affects the Australian stock market volatility. In conjunction to the hazards stated, the impacts are directly proportionate to the companies where it can affect quantity and quality of agricultural production. When all these problems happen together, then the companies' performance will drop and eventually lead to the reduction in share price volatility (Seetharam, 2017). Thus, unfavorable movements in share price volatility will be reflected. Based on Piao et al (2010) study, China faced big economic losses due to the flood in Yangtze where it affected the land, houses and crops production.

3.2 Climate Change and Stock Market Risk Premium

3.2.1 Market Volatility, Risk and Risk Premium

Capital investments always requires some anticipation due to their long-run nature (Mendelsohn, 2012). Stock returns reflect the present value of discounted future profits. Discounted profit variable is probably more accurate as it provides a lower-estimate when measuring adverse impact of an event (Seetharam, 2017).

Most studies have discovered evidence that stock price slipped in response to negative environmental news and rise in response to positive environmental news (Beatty & Shimshack, 2010). Price change of stock will reflect market view about expected changes in firm level benefits and cost arising from climate change. If the market is efficient, the impact of such information should be signal in short run stock price changes (Beatty & Shimshack, 2010).

Edward M. Saunders was the pioneer in studying the relationship between the weather in New York City and stock returns on the New York Stock Exchange (NYSE). The study in 1993 drew a conclusion that there is a strong correlation between cloud cover and equity market returns. Since then, it raised economist attention to the possible effect of weather changes on stock market returns (Wang, Shih, & Jang, 2018). sampled data from the Shanghai Stock Exchange and concluded that extreme weather affects market volatility. On the other hand, research conducted by Cao and Wei

(2005) derived that many stock markets world-wide has a statistically significant, inverse correlation between temperature and returns across the complete range of temperature data. Stock returns are inversely correlated with temperature: lower temperature is associated with higher the returns, and vice versa.

Persistent temperature shifts have a significant negative effect on overall wealth and bring a positive risk premium in equity markets, by observing data from the US and global equity markets. Risk premium for low-frequency temperature fluctuations has been increasing over time along with temperature (Bansal, Kiku, & Ochoa (2016). The scholars suggested that forward-looking equity prices that are determined by the discounted value of future growth rates provide important information about the cost of long-horizon temperature fluctuations.

Hong, Li & Xu (2019) examined if stock markets efficiently price risks brought on or intensified by climate change. Their study shows the relationship between climate risks and stock markets in an international sample of countries. They have quantified the drought by employing Palmer Drought Severity Index (PDSI) from climate studies. The study was not able to find out the deterioration of profitability ratios and stock return for food companies in the nation, which comes to their conclusion that stock market are inefficient with respect to information about drought trend, which is classified as one of the most crucial climate risk that resulted from climate change. In the study, the scholars have inferred that the source of under reacting of stock prices to the climate change risk, may be due to negligence, which could possibly combine with other reason such as home country equity bias and other institutional investors frictions.

In the study of Beatty and Shimshack (2010), their finding suggested that release of climate rating had a swift and statistically strong impact on the capital market returns. Climate rating had statistically and profoundly impact on stock market return. Climate change affects the economy, companies, consumers, investors and security, all of which affect stock exchanges and financial markets, influence the underlying system as well as the confidence of market (Climate Disclosure Standards Board, 2014).

Seetharam (2017) was on the standpoint that stock prices either only respond to news, or otherwise fully incorporate essential information concerning the adaptive capacity of the firm through financial mechanisms like insurance, or by the strategic choice of plant location. In this case, stock prices may not be affected by disaster shocks.

Stock market can be prominent and very influential to the financial market. Stock market is in a special position to launch or devoted to the protection of financial markets. It can be done through direct or indirect support for the embedded climate risk in the financial reporting. At the same time, it helps to manage the climate risk and opportunities that arise from various exposed sectors of business. It also contributes to the financial stability agenda and to encourage transparency and governance practices that build public trust, enhance accountability and provide confidence to market actors (Climate Disclosure Standards Board, 2014). Stock market efficient response to climate risk is often highlighted in climate finance related research, as it is a provider of long- term market infrastructure with extensive networks.

3.2.2 Climatic Risk Premium for Agriculture Firm

Climate change will greatly affect the agriculture sector, and it is a major probable threat to food security as well as agriculture for the country, as it will impact the sector in terms of production. The consequences of it will be felt for many years as the climate change is a timeless and long-term process (Austin & Baharuddin, 2012). As climate changes, firms will observe fluctuation of agriculture productivity positively, or negatively. Climate altered the marginal productivity of selected industries such as agriculture and forestry (Mendelsohn, 2012).

Impact of adverse weather, which lowers yields and lower supply are one of the factors that pushed up the agriculture price (Baffes & Haniotis, 2016). Corporate processes which production is highly vulnerable to natural disaster such as pro longed drought will likely to experience significant damage to corporate profit (Hong, Li, & Xu, 2019).

In the investigation of Zhu, Guo, You and Xu (2016), the research focus on the stock price efficiency of food companies in response to information about drought. they summarized the dependence between the response of Chinese industry stock markets and crude oil market exists, which the global oil and Chinese stock markets moved in the same direction, and the stock prices plunged with global oil prices. Drought is recognized as one of the most destructive factors for economic production, which is one of the natural disasters that might be heightened by climate change (Hong et al., 2019).

CDP and Sustainable Insight Capital Management has released a report which disclosed that industry leadership on climate engagement was associated to higher performance on three financial metrics – return on equity, cash flow stability and dividend growth (Climate Disclosure Standards Board, 2014).

In March 2014, General Mills informed the investors that extreme weather has led to disruption in the production and operations, further aggravated on the deteriorating sales performance, which was the evidence of climate change impacts on agriculture and food production. In 2009, droughts in India have caused the plunge of Indian sugar output forecast by 44%. Consequently, sugar prices achieved 3 years high in early August 2009 on the New York Stock Market, while also reaching their peak of near to 30 years high on the London Stock Exchange. In total, price of sugar elevated by 64% in 2009 on the expectation that the subsequent two years, India would become a net importer for sugar (Climate Disclosure Standards Board, 2014)

In the report of Malaysian Palm Oil board (Abdullah, 2010), El Nino was deemed as a evident fact that oil palm fresh fruit bunch (FFB) yield could be affected by the El Nino episode attributable by the lower rainfall period. El Nino has been categorized as one of the uncertainties that impacted on the CPO production, and analyst expected to be unstable due to the speculation of the event.

The research of Nadolnyak, Vedenov, & Novak (2008) were in view that their article was the pioneer to investigate the effect of ENSO phases on yield distributions and their involvement for the rating of crop yield insurance contracts in the context of several crops grown in the South Eastern United States. Their study also pointed out

that both farm- and area-level yield insurance contracts offered by the Federal crop insurance program confided primarily on recent yield history in calculating premium rates, but does not include any long-term climate forecast information that might be relevant to the insured yield distributions.

There was earlier study discovered that ENSO variability influenced crop production and precipitation. The findings have incentivised agricultural economists to assess the economic impact of ENSO variability on U.S agriculture. Nonetheless, the recommendation from scholars that suggest including the impact of ENSO in the framework of agricultural management instrument only kicked in after 1998 El Nino event (Jiang and Fortenbery, 2019).

As weather is the major contributing factor to crop productivity, theoretically, it is logical to expect that ENSO phases affect crop yields in the areas where they affect climate. Given that the theory is right, it is then important to know whether the effects are significant enough to be accommodated in agricultural risk management (Nadolnyak et al., 2008).

Climate risk variables can be derived to numbers and have been used opportunely in the weather derivatives pricing. However, the next questions that arise will be the extent of the information of such risk is seized and appropriately discounted in equity markets. Up to date, this area has not received much attention. This research concluded that such climate risk information, is not efficiently priced, at least when it comes to natural disasters (Hong et al., 2019).

Climate studies have provided evident and consistent findings that proposed a strong connection between global warming and droughts. Drought is an avenue through which a warming climate might affect the stock markets and global economies. Droughts impaired food industry profitability. The moving average of the PDSI index was found to be strongly correlated to changes in food industry profitability ratios, which is measured by industry net income over assets. As droughts are considered economically alarming, the scholar suggested the PDSI Index to be elevated for a prolonged period (Hong et al., 2019).

IFC report of 2009 has endorsed on the point that stock exchanges and market actors are critically dependent on good quality information to maximum their chances of determining if the factors are more probably to converge to create risk or opportunity. The report was with the view that not all investment will be impacted by climate impact and will not be affected in the same way. The severity of the impacts will depend on numerous factors including climatic sensitivity, location, management practices, market conditions, existing policies and regulations (Climate Disclosure Standards Board, 2014).

The literature of Jiang and Fortenbery (2019) focused on addressing strategies to monitor the price side of risk with market instruments. The most recognizable related instruments are soybean futures and options contracts; thus, it couldn't be the only indicator to mitigate the risk. Even though agricultural futures prices are sensitive to weather variations, the futures and spot markets for soybeans may behave to abnormal extreme weather differently and expose soybean growers/merchandisers to un-hedged risk during extreme weather. To date, they suggested that existing risk management

strategies in historic markets may be less effective on risk mitigation than historical experience, if the soybean futures market experiences was inefficient during the extreme ENSO cycles. To date, little to no research has looked at this issue (Jiangand Fortenbery, 2019).

If ENSO phrases make a difference in the expected loss, climate forecast can be utilized in rating of the area yield insurance contract, which can enhance the actuarial soundness for furnishing the fair premium rates accordingly. This finding recommended that producers would gain advantage from the information on ENSO phases if the insurance premium are adjusted, and insurance companies should have made that adjustment potential increase in climate variability for the rate of insurance (Nadolnyak et al., 2008).

There are numerous regulatory bodies attempted to motivate voluntary as well as mandatory disclosure of corporation's climate risk exposure to address this issue. Anyhow, there is insufficient systemic research on the topic of climate risk and related market efficiency (Hong et al., 2019).

The National Hydraulic Research Institute of Malaysia (NHRIM) acknowledged that enhancement of the climate-change projection should be done. Uncertainties will persist, such as the magnitude of climate change, the technology available, crop and pest responses. The study of Austin and Baharuddin (2012) observed that adaptation measures are insufficient, as well as the policies and absence of assessment methods.

A growing number of central banks around the globe has raised concern about climate change and perceived it as a threat to financial stability, which becomes an issue that falls under their purview. Eight central banks and financial supervisory agencies formed the Network for Greening the Financial System and exchanged view for the risk magnitude that global warming poses to financial system. Within 18 months, the body has grown to 36 members, included representation from Asia countries like China, Singapore, Japan, Malaysia and Thailand (Nikkei Asian Review, 2019).

A more powerful and accurate national capability to predict the effects of climate variability and subsequent weather-related hazards is critically necessary. This capability must be extended to include forecasting for agricultural commodities based on the changing climatic environment, such as in the form of a simulation model or expert system. The capacity of weather prediction of forthcoming climate variation should be in place. It will be best if it can forecast the magnitude and duration. This capability would also enable the prediction of the possible impact of climate variation on agricultural production.

Highly credible information about climate change plays vital role in unlocking the private investor capital. It is necessary to identify the climate financing need. The World Economic Forum expect that immense amount per annum is needed for investment in mitigation and adaptation for climate change-related activities, which include enhanced infrastructure, a more resilient agriculture and water resources.

Regrettably, there has been so little climate change to date, that the inter- temporal record is dominated by non-climate factors such as economic development, price volatility and even technological changes.

Adaptations included changes in behavior and capital motivated by climate change. The study of R. Mendelsoh (2012) suggested that adaptations are largely local; the climate that is material to the public is the future local climate. There is a deliberate distinction between adaptations that are made in advance of climate change versus adaptations that are made after the climate changes. With perfect information, adaptations would be timed to occur precisely as the climate changes. However, this is highly ambiguous area as climate models are imperfect at forecasting what is going to happen in each place (especially precipitation changes) (R.Mendelsohn, 2012).

Linnenluecke. Griffiths & Winn (2012) are on the standpoint that anticipatory adaptation to extreme weather events will help to build organizational resilience if there is availability of resources and capabilities readily for an organization to be more resistant or rebounded more swiftly from adverse impacts of more frequent and/or severe extreme weather events.

In the study of Austin and Baharuddin (2012) recommended that authorities should give strong support the proposed Numerical Weather Prediction Centre under the Malaysian Meteorological Services Department to enhance the national weather prediction competency. R. Mendelsohn, (2012) also urged International agencies to take up the responsibility to estimate the funding of adaptation that would be required in the future.

3.3 Climate Change and Cost of Equity (Dividend) of Company

Company needs to provide dividend to its shareholders, which is called as cost of equity. Dividend policy refers to the "distribution of cash to shareholders over time". As the level of equity retained in the company is affected by dividend decisions, financial managers are very careful in choosing the dividend policy. Dividend payouts influence the firm's value and most importantly, the wealth of the shareholders (Lease, John, Kalay, Loewenstein, & Sarig, 2000). Over the years, four main topics have been addressed in dividend policy literature, i.e. the manner of determining dividend payout, the relevancy of dividends, inter-country differences in company's dividend distribution and disappearing dividends in emerging markets (Robinson, 2006). There have been three different approaches found for the setting of dividend policy among US companies.

First, there are companies that target long term payout ratio and determine dividend payout as a percentage of earning. Secondly, there are firms that have stable dividend payments over time as they believe this is the preference of investors. Lastly, some managers consider the change in level of dividend payouts important because it gives valuable information to the investors. In addition, from the manager's point of view, the current rate of dividend payouts is usually used as a benchmark to set the dividend policy (Lintner, 1956). Since a change in dividend policy in a firm means a change in financial policy of that firm, there are some questions about why firms enact dividend changes, with some companies attempting to reduce dividends while others deciding not to pay dividends to shareholders.

As reported by Lintner (1956), changing dividend policy illustrates changes in the firms' earnings. Firms with stable dividend policy are more preferred by investors and

managers. On the other hand, as omitting the dividends can be a negative signal to the market which conveys information about the firms' financial distress; the managers are usually unwilling to omit or reduce the dividends as stated by De Angelo and De Angelo (1990).

According to their extensive study of dividend changes, Brav et al. (2005) argued that keeping the level of dividends constant is a main concern for investment decisions. In contrast with Lintner's findings, managers are reluctant to increase dividend payment at the same time with any rise in earnings, because they no longer consider dividends as the main decision variable (Brav, Graham, Harvey, & Michaely, 2005).

In terms of dividend policy in emerging markets, one important characteristic of emerging markets must be considered, i.e. the government exerts a control on the firms' financial decisions through some fiscal policies (Glen, Karmokolias, Miller, & Shah, 1995). Adaoglu (2000) supports this view, based on evidence from his study regarding dividend instability in public listed firms in Turkey.

Moreover, climate change can be an important factor to determine the dividend policy of the climate linked companies, like agro and plantation companies. Due to adverse climatic impacts, investors expect low return from the company and will not interested to hold the share of the company. Therefore, to maintain the stability in share price, companies need to provide better dividend. Due to extra risk of climate change, if companies do not provide better dividend, investors will not be interested to hold the share of the company and that will ultimately reduce the share price. However, there are very few studies examine the relationship between floods or El Nino and relevant company dividend payout policy.

3.4 Climate Change and Stock Market Investor's Behavior

There are many factors that influence the behavior of investors and determine their investment decisions. Kadiyala and Rau (2004) investigated investor reaction to corporate event announcements. They concluded that investors appear to under react to prior information as well as to information conveyed by the event, leading to the different patterns: return continuations and return reveals, both documented in long-horizon return. They found no support for the overreaction hypothesis. Merikas et.al., (2003) adopted a modified questionnaire to analyze factors influencing Greek investor behavior on the Athens Stock Exchange. The results indicate that individuals base their stock purchase decisions on economic criteria combined with diverse other variables. They do not rely on a single integrated approach, but rather on many categories of factors. The results also revealed that there is a certain degree of correlation between the factors that behavioral finance theory and previous empirical evidence identify as the influencing factors for the average equity investor, and the individual behavior of active investors in the Athens Stock Exchange(ASE) influencing by the overall trends prevailing at the time of the survey in the ASE.

Malmendier and Shanthikumar (2003) found that large investors generate abnormal volumes of buyer-initiated trades after a positive recommendation only if the analyst is unaffiliated. Small traders exert abnormal buy pressure after all positive recommendations, including those of affiliated analysts. Hodge (2003) analyzed investors' perceptions of earnings quality, auditor independence, and the usefulness

of audited financial information. He concluded that lower perceptions of earnings quality are associated with greater reliance on a firm's audited financial statements and fundamental analysis of those statements when making investment decisions. Krishnan and Booker (2002) analyzed the factors influencing the decisions of investor who use analysts' recommendations to arrive at a short-term decision to hold or to sell a stock. The results indicate that a strong form of the analyst summary recommendation report, i.e., one with additional information supporting the analysts' position further, reduces the disposition error for gains and also reduces the disposition error for losses.

Nagy and Obenberger (1994) examined factors influencing investor behavior. They developed a questionnaire includes 34 questions. Their findings suggested that classical wealth – maximalization criteria are important to investors, even though investors employ diverse criteria when choosing stocks. Contemporary concerns such as local or international operations, environmental track record and the firm's ethical posture appear to be given only cursory consideration. The recommendations of brokerage house, individual stockbrokers, family members and co-workers go largely unheeded. Many individual investors discount the benefits of valuation models when evaluating stocks. Epstein (1994) examined the demand for social information by individual investors. The results indicate the usefulness of annual reports to corporate shareholders. The results also indicate a strong demand for information about product safety and quality, and about the company's environmental activities. Furthermore, a majority of the shareholders surveyed also want the company to report on corporate ethics, employee relations and community involvement.

Similarly, few studies also test investor's behavior related to climatic events. There is a study conducted by Zhou and Botzen (2017) found that the impact of typhoons and floods on firms' growth in term of capital, labors and valued added is significantly positive in short run. However, the authors found that typhoons and floods have stronger positive impact on the labors and valued added growth for the firm with more financial constraints but not in capital growth, where the financial constraints stated in the study is dividend payment (Zhou & Botzen, 2017). Furthermore, the result of the research conducted by Koerniadi, Krishnamurti and Tourani-Rad (2016) shows that floods has positively influence the cumulative market return. Nevertheless, Worthington and Valadkhani (2004) found there is a significant relationship between bushfires, cyclones, earthquakes and market return in Australian equity market, but the authors did not find any significant association between flood and market return which are including dividend and capitalization changes in Australian equity market.

4. RESEARCH METHODOLOGY

This section discusses about the methodology of the research under four objectives. For each objective, the data, variables, model estimations, analytical tools, measurement of model efficiency, etc. methods are described here.

4.1 Climate Change & Stock Market Volatility

4.1.1 Data and Sampling

The target sample in this study is the companies of plantation sector in Malaysia. Initially, this study considered to collect secondary data for 16 years from 2001 to 2016. When conducting this study, 42 companies were registered under Bursa Malaysia Main Board. However, 9 companies were eliminated, and 2 years of study period have been decreased for this study due to unavailability of data. Therefore, 33 companies were selected for this study with 14 years of study period from year 2003 to 2016. Hence, the total sample for this study consists of 462 company-year observations. Table 4.1 shows the selected companies in Malaysian plantation sector for this study.

Table 4.1: Sample of Plantation Companies to Estimate Climate Change Induced Stock Market Volatility in Malaysia

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

Source: Bursa Malaysia (2018)

The data for this study were acquired from financial statements of public listed companies. Data for ariables were acquired from Main Board of Bursa Malaysia, Bloomberg, and Thomson Reuters Datastream and the historical information of

Climate Prediction Centre USA for El Nino variable and FloodList and Wikipedia for flood variable.

4.1.2 Measurement of Variables

Share Price Volatility

To compute share price volatility, initially the annual range of share price is to be divided by the highest and lowest average adjusted share price for each evaluation year and the outcome is raised to the power of two. Further, the average value is calculated for all years of evaluation and to achieve a variable comparable to standard deviation the square root transformation is utilized. Share price volatility computation method is consistent with Baskin (1989) study and the formula is as follows:

$$PVOL = \sqrt[2]{\sum_{i=1}^{n} ((H_i - L_i) / (\frac{Hi+Li}{2}))^{\wedge 2}}$$

Whereby,
PVOL = Share price volatility
H_i = Highest share price for year i
L_i = Lowest share price for year i

Dividend Pay-out Ratio

Dividend pay-out ratio is the ratio of dividends per share to earnings per share. Extreme value problems were minimized by this procedure in individual years to low or possibly negative net income (Baskin, 1989). To calculate this variable, the common shareholders' cash dividend is divided by the net profit after tax for each evaluating year.

$$PAYOUT = \sum_{i=1}^{n} Di/Ei$$

Whereby,
PAYOUT = Dividend pay-out ratio
D_i = Total of annual common shareholders cash dividend in year i
E_i = Net profit after tax for year i

Dividend Yield

Dividend yield is shown as the dividend per share as a share price percentage (Baskin, 1989). To calculate this variable, the common shareholders' cash dividend is divided by each company's market value at the year end.

$$DYIELD = \sum_{i=1}^{n} (Di/MVi)$$

Whereby,
DYIELD = Dividend yield
D_i = Total of annual common shareholders cash dividend in year i
MV_i = Company's market value at the end of year i

Market Value

By utilizing share price to multiply by the number of ordinary shares in issues, market value variable will be computed. Then a natural logarithm transformation is utilized. The formula to calculate the variable is as follows:

$$SIZE = Ln \left(\sum_{i=1}^{n} MVi\right)$$

Whereby,
SIZE = Market value
MV_i = Company's market value at the end of year i

Long-Term Debt

Long-term debt which is precisely known as financial leverage concludes the leverage that is undertaken by a stock. To compute this variable, long-term debt ratio whereby more than one year of maturity obligation to total asset is calculated for each evaluating year.

$$DEBT = \sum_{i=1}^{n} LDi/ASSETi$$

Whereby,
DEBT = Long-term debt
LD_i = Long-term debt at the end of year i
$ASSET_i$ = Total asset at the end of year i

Earnings Volatility

Earnings before interest and taxes (EBIT) to total assets is being used by this study to calculate the earnings volatility. According to Baskin (1989), initially total EBIT to total asset ratio should be acquired for all evaluating years. Further, to achieve the return on assets' standard deviation, a square root transformation was used to obtain the earnings volatility. The formula to calculate the variable is as follows:

$$EVOL = \sqrt[2]{\sum_{i=1}^{n} (R_i - \overline{R}) \text{ ^2}}$$

Whereby,
EVOL = Earnings Volatility
R_i = Operating income to total asset ratio for year i
$\overline{R} = \sum_{i=1}^{10} R_i / n$

Growth in Assets

Growth in assets is defined by using the ratio of year end change in total assets to the level of total assets at the beginning of the year. To calculate this variable, change in total asset ratio at year end to total asset at the beginning of the year is calculated for each evaluating year.

$$GROWTH = \sum_{i=1}^{n} \left(\frac{\Delta ASSETi}{ASSETi}\right)$$

Whereby,
GROWTH = Growth in Assets
Δ $ASSET_i$ = Change of total asset in year i
$ASSET_i$ = Total asset at the end of year i

El Nino

According to Kiladis and Diaz (1989) and Kovats et al (2003), El Nino Southern Oscillation (ENSO) is a climate event which started in Pacific Ocean related to floods and droughts and affects especially the atmospheric circulation worldwide.

El Nino (ELN) serves as a dummy variable in this research and value 1 represents the presence of El Nino, consequently value 0 depicts zero El Nino event.

Flood

Flood (FLD) can cause several damages and can be a distraction to the entire nation. Collier (2007) mentioned that this natural disaster can happen at any time and can cause problems such as crops and infrastructure damage, mud flows and even landslides.

Flood serves as a dummy variable in this research and value 1 represents the presence of flood, consequently value 0 depicts no flood event.

4.1.3 Data Analysis Techniques and Model Estimations

Descriptive Statistics

The total sets of factors on the sample of data collected in quantitative research were described in this approach. The implication on mean, standard deviation, maximum and minimum of share price volatility (PVOL), dividend payout ratio (PAYOUT), dividend yield (DYIELD), market value (SZE), long term debt (DEBT), earnings volatility (EVOL), growth in assets (GROWTH), El Nino (ELN) and flood (FLD) were tested to signify the general overview on dividend policy and volatility of share price in the listed companies of Plantation sector in Malaysia.

Correlation Analysis

One of the common and useful statistics is the correlation analysis whereby it begins from two or more random independent variables and relates between mean values relationship (Rodgers & Nicewander, 1988). A correlation analysis portrays the degree of relationship between two sets of variables for instance dividend policy and share price volatility in a single set of digits.

Panel Data Analysis

Based on Freedman (2005), regression analysis is a statistical tool for the investigation and analysis of relationship between variables. The focus here is on the relationship between a dependent variable and some independent variables. The regression

analysis is utilized for forecasting, predicting and to understand how the independent variables are related to the dependent variable (Freedman, 2005).

The common research instrument or method that is used to test hypothesis is Pooled Ordinary Least Square (OLS) linear regression. In this panel data study model, methods such as Pooled OLS, Fixed Effect and Random Effect were applied. This study adopts the theoretical framework of Baskin (1989) study. By applying correlation analysis and least square regression, the relationship between dividend policy and volatility of share price is tested.

Initially, Baskin (1989) regressed the share price volatility on two main independent variables which are dividend payout ratio and dividend yield using multiple least square regression. Thus, Equation 1 is formed and is depicted as follows:

$$PVOLn = a0 + a1PAYOUTn + a2DYIELDn + \epsilon \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Subsequently, Baskin (1989) expands the equation by proposing other control variables which includes market value (SIZE), long-term debt (DEBT), earnings volatility (EVOL) and growth in assets (GROWTH). Thus, Equation 2 is formed and is depicted as follows:

$$PVOLn= a0 + a1PAYOUTn + a2DYIELDn + a3SIZEn + a4DEBTn + a5EVOLn + a6GROWTHn + \epsilon \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Further, looking into the scope of this study, companies such as plantations may be affected by climatic factors, such as El Nino and flood. The described natural disasters have the tendency to destroy the crops, infrastructure and the facilities of plantation companies. To analyse these factors, El Nino (ELN) and flood (FLD) have been included as dummy independent variables into the regression equation. Thus, Equation 3 is shown below:

$$PVOLn= a0 + a1PAYOUTn + a2DYIELDn + a3SIZEn + a4DEBTn + a5EVOLn + a6GROWTHn + a7ELN + a8FLD + \epsilon \ldots\ldots\ldots\ldots\ldots (3)$$

The abbreviations towards the models are shown below:

$PVOL_n$ = Share price volatility for company n
$PAYOUT_n$ = Dividend payout ratio for company n
$DYIELD_n$ = Dividend yield for company n
$SIZE_n$ = Market value for company n
$DEBT_n$ = Long-term debt for company n
$EVOL_n$ = Earnings volatility for company n
$GROWTH_n$ = Growth in assets for company n
ELN_n = El Nino for company n
FLD_n = Flood for company n
$a_0, \ldots, a_2$ = Apriori expectation
ϵ = Stochastic Error Term

Diagnostic Tests

According to Pesaran (1987), econometric means the statistical methods applied to economic data and describing it to give empirical content to economic relations. Consequently, Normality, Variance Inflation Factor (VIF), Modified Wald test, Lagrangian Multiplier (LM) test and Hausman tests were used in this study to check multicollinearity and heteroskedasticity problems and to check which regression model is suitable for this study (Pooled OLS, Random or Fixed Effects model). Further, these tests were also used to ensure the data sample and variables are valid and a proper method has been utilized.

Lagrangian Multiplier Test (Breusch and Pagan): Random effect model is tested based on the Breusch and Pagan Lagrangian Multiplier (LM) test. Based on Baltagi and Li (1995), LM test assists in deciding whether Pooled OLS model or a Random effects regression is to be used for the study. Random effects regression can be used rather than the Pooled OLS model if the probability chibar^2 is less than 0.05.

Hausman Test: Fixed effect model is tested based on the Hausman test. Based on Hausman (1978), the test helps in deciding whether Random effects model or a fixed effects model regression is to be used for the study. Fixed effects regression can be used rather than the Random effects model if the probability chibar^2 is less than 0.05.

Multicollinearity Test (Variance Inflation Factor): Initially, the existence of linear relationship among all or some of the independent variables is called multicollinearity. York (2012) stated that to get no collinearity, other independent variables can be included which is uncorrelated with the current independent variable. According to Gujarati and Porter (2009), the regression analysis will not be able to depict the influence of independent variable on the dependent variable accurately if multicollinearity exist. Then, one of the methods to detect multicollinearity is Variance Inflation Factor (VIF). VIF detects the variance level of the regression coefficient which is inflated because of multicollinearity existence in the model. The guideline of VIF value is 10. Multicollinearity problem exists if the VIF value exceeds 10, which portrays that there is a high collinearity among independent variables.

Modified Wald Test (Heteroskedasticity): According to Gujarati and Porter (2009), heteroskedasticity is the unbalanced spread in error variance and it is a test used to examine the constant error variance. When the error variance terms are not achieved at the optimal level, then the heteroskedasticity problem happens and causes the parameter of estimation to become inefficient. Increase in variances will occur if heteroskedasticity problem were to be found in the model and it will be summarized as inefficient. Alternate hypothesis (H_1) portrays that the data is heteroskedastic while null hypothesis (H_0) portrays that the data is homoscedastic. If Chi^2 probability value is significant, then the null hypothesis can be rejected and concluded data is heteroskedastic significant.

4.2 Climate Change and Stock Market Risk Premium

4.2.1 Data and Sampling

This study intended to calculate the 40 plantation firms listed in Bursa. 3 of the companies were actually listed out in the process for collection of secondary data, due to issue such as the core business of the plantation firms were more to equipment

instead of the commodities, and some chosen company for the study turns out to have more diversified business under the same group, which result might be distorted. One of the listed companies did not have stock market data prior to 2012, which also excluded out from this research. The final data that included in this study were 37 firms with availability of data from 2009 to 2018, for the consistency to measure the market returns of all the stock prices.

The BETA of each company has been included in this study, to gauge the volatility of the firm's stock price in response to the major Index movement. By comparing the raw BETA and adjusted BETA, adjusted Beta will be taken to make comparison to the BETA of the market Index.

It is more comparable to KLCI by using the event date. The source of this data is extracted from Bloomberg Terminal, from 2009 to 2018, which covers the El Nino event that happens within the last 10 years. There are two market indexes are included in this research. Kuala Lumpur Composite Index (KLCI) and Kuala Lumpur Plantation Index (KLPLN).

El Nino initially attribute to an annual warming of sea-surface temperatures along the west coast of tropical South America. This phenomenon is not wholly predictable as a result of the complexity that consequent from the relationships between ocean currents, atmospheric circulation and winds in the Pacific. This phenomenon occurs when the ocean surface warms up higher than the average temperature. The heat gets blown into atmosphere and will spur abnormal weather around the world. (National Weather Service).

The process to obtain El Nino event data wasn't straightforward. El Nino event date of Southeast Asia is recorded by Australian Government Bureau of Meteorology (BOM), which oversee the Oceania region. Bureau climatologists of BOM established an alert system for the El Nino Southern Oscillation, which is called ENSO Outlook. This phenomenon is not wholly predictable as a result of the complexity that consequent from the relationships between ocean currents, atmospheric circulation and winds in the Pacific. (Gallo et al., 2015).

The finding is contradicting with the study from Jiang, & Fortenbery, (2019), which climatologists have discovered that El Niño and La Niña events could be forecasted, and the increased frequency of occurrences is often coming along with climate change. AccuWeather Senior Meteorologist Dale Mohler opined that each El Niño is created equal, and strong El Niño also tends to last longer, sometimes up to two years. Timing of where the impact begins seems to be random from year to year.

As the consequences of the event is severe and accumulated loss due to the event are concerning, there several global agencies monitor the ocean along with NOAA, BoM, Japanese Meteorological Agency are issuing summaries based on the progress of ENSO on a monthly or bi-monthly basis.

There are several indicators that furnished information about the state of ENSO at a given time. Each meteorological agency that monitors the state of the El Niño Southern Oscillation has a different definition of what constitutes an El Niño event tailored to their needs. Southern Oscillation Index (SOI) is one of them, which is

derived from the monthly fluctuations in the air pressure difference between Tahiti and Darwin.

Persistent negative values of the SOI indicate El Nino episodes, while sustained positive values of the SOI indicate La Nina episodes. Another indicator of ENSO is the Multivariate ENSO Index (MEI), which is a monthly measure based on the six main observed variables over the tropical Pacific. (Gallo et al., 2015). Here are other Index available to measure El Nino by different countries, beside the Southern Oscillation Index (SOI), there are namely NOAA Oceanic Niño Index (ONI), Japanese Meteorological Agency ENSO Index (JMA), Multivariate ENSO Index (MEI).

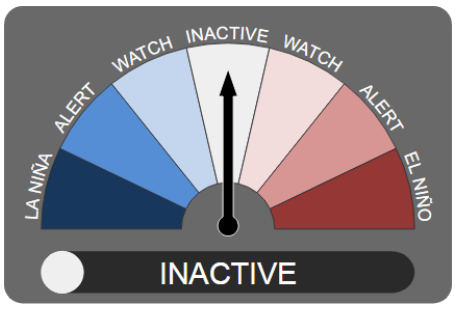

Figure 4.1: El Nino Southern Oscillation (ENSO) Outlook
Source: Australian Government Bureau of Meteorology (BOM)

It is a meter ranged from Inactive, Watch, Alert, to El Nino. Below is the criterion that indicates the changes of status for ENSO outlook (Figure 4.1). ENSO outlook was updated fortnightly; however, the daily interval data is unavailable to the public. The monthly data is available in the website with the graph and analysis. Official ENSO indicator is the Ocean Nino Index (ONI), which is based on sea surface temperature in the east central tropical Pacific Ocean.

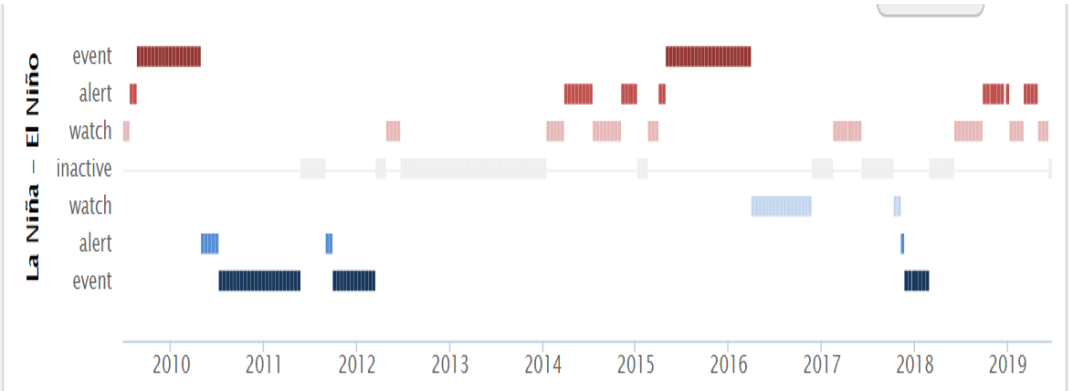

Figure 4.2: Fortnightly History of ENSO Outlook Status: 2010-2019
Source: Australian Government Bureau of Meteorology (BOM), 2019

There are multiple ways of measuring ENSO. The most traditional method is the Southern Oscillation Index (SOI), which measures the difference between the atmospheric pressure at sea level at Tahiti and at Darwin, and SOI refers to the air pressure Index. According to NASA Technical memorandum published in 1985, southern oscillation / El Nino (ENSO) is the single most outstanding annually signal

in global atmospheric/ ocean fluctuations. The phenomenon known as El Nino event has caused extensive meteorological disruption. From the studies of NASA with 90 years span (1900 to 1979), there were 30 El Nino events; the result is generally associated with the pronounced drops in SOI value (Figure 4.2).

The specific date of El Nino depends on the definition of the event. As many indexes are not available for daily interval, it becomes a limitation of this study to engage more Indexes for comprehensive aspect to evaluate specific event date for El Nino. For the purpose of this study, El- Nino is defined by the proxy, which is NINDSOIA Index. NINDSOIA, short for Commonwealth Bureau of Meteorology El Nino 30D Moving (Figure 4.3) Average Southern Oscillating Index is an event Index which is available daily. It measures the moving average of 30 days SOI reading.

Figure 4.3: Commonwealth Bureau of Meteorology El Nino So Oscillating Index (NINDSOIA) Data
Source: Bloomberg Terminal

As shown in the Figure 4.4, within the range of years in the chart, El Nino is noticeable in end of 2009, and also the period from 2015, which will be included in the range of this study, from 2009-2018.

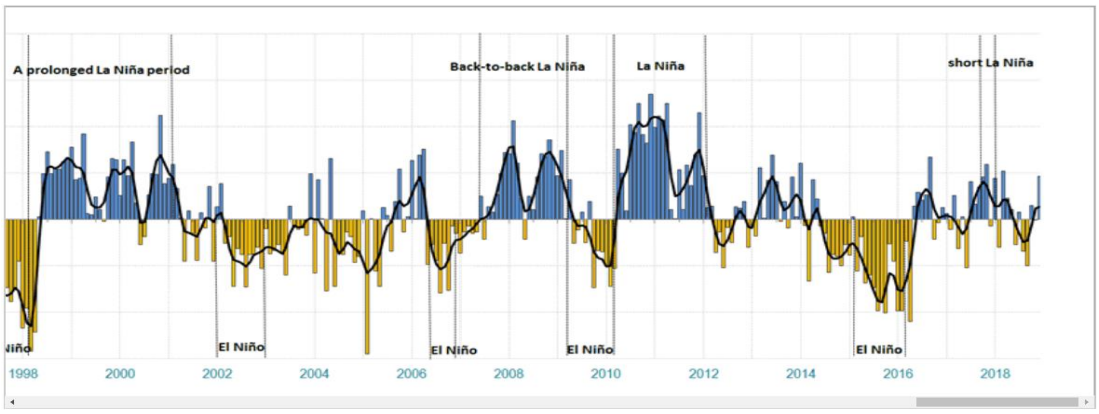

Figure 4.4: Monthly Southern Oscillation Index (SOI) Values: 1876-2018
Source: Australian Government Bureau of Meteorology (BOM), 2019

4.2.2 Measurement of Variables

If the NINDSOIA Index is with average of -8 or lower, El Nino is underway and consider as dummy data of 1. It indicates a warming of equatorial Pacific Ocean that could impact the weather of Asia, the Americas and Australia. The reading below -8 was due to a weakening of trade winds that normally push sun-warmed waters to the west.

On the other hand, La Nina, the wind will strengthen, and reading will be above 8. So, the value above -8 is consider as non- El Nino for the study and consider as dummy variable value 0.

4.2.3 Data Analysis Techniques and Model Estimations

Correlation Analysis

There were a few correlation tests run with SPSS, statistic software which is commonly used for the social science researches. After gather the result of return for both Indexes and individual stock prices, the data is then break down into three categories for the correlation test.

Market Risk (BETA) Analysis

Stock's Beta is a measure used in fundamental analysis to determine the volatility of an asset or portfolio in relation to the overall market. It is also used to measure the systematic risks associated with a specific investment. According to T.Chris (2008), a standard way of estimating Beta uses ordinary least squares (OLS) regression which equivalent to formula with the ratio of Covariance between investments versus market return)/ Variance of market returns. The formula of Beta could be written as:

$$\beta = \frac{\mathrm{Cov}(r_a, r_b)}{\mathrm{Var}(r_b)}$$

Where,

ra= Individual stock
rb = Market Index

Overall market has a beta of 1.0, and individual stocks are ranked according to how much they swayed from the market, and how responsive the firm's stock moved in tandem to the market condition. Stock with higher Beta than the market is riskier, but higher potential for the higher return. Low Beta stock is less risky and yield lower return. Beta could impact a firm's share valuation, as higher Beta indicated a higher cost of capital discount rate, which resulted in elevated expectation of return from the investors.

Beta is a component used in CAPM model to calculate the expected market return of a stock or portfolio. Beta analysis provided great insight of a stock market performance relative to market movement. The limitation of Beta will be the dependency on the historical price movement, which can't be served as an informative projection for the future market movement.

The return of the stock markets for 3 time series are calculated with the below method to derive the BETA

i. Variance of each Indexes and Individual stock market return
ii. Covariance of KLCI to the KLPLN Index and Individual stock return
iii. BETA of the Indexes and individual stock return

Market Return Analysis

There are a few methods could be used to estimate the cost of equity, the DCF method, the risk premium method, and the CAPM. For the purpose of this study, risk premium method is employed to review the expected return of plantation stock market of El Nino period, and compared against Non-El Nino period.

Market Risk Premium Analysis

Risk premium approach is a common method applicable for active portfolio management. It classified different asset based on their related risk and allocate the asset accordingly to determine based on expected returns. For an investor, it is the minimum amount of money which the return will be expected to exceed the known return of risk-free asset. Brigham (1985) asserted that risk premiums must be based on expectations, not on past realized holding period returns. The return is measured by using the following formula.

$$\text{Return of Stock/Index} = \frac{\text{Close Price of Today- Close Price of Yesterday}}{\text{Close Price of Yesterday}}$$

Event Study

As the event is long time horizon, it is difficult to find out the impacts under Event Study such as, Constant mean return model, Market model, Cumulated Abnormal Returns, and Buy and Hold Abnormal Returns. This study intent to investigate the equity market risk premium arise for plantation companies of Bursa Malaysia, in the

events of El Nino. The volatility of share price for plantation companies with El Nino Period and Non-El Nino period will be compared with the Beta analysis. This study employed the Beta Analysis illustrate the impact of climate change to the stock market performance of plantation firm in Malaysia. The return of the stock market was compared against the KLCI Index to derive the returns of each individual stock and their price movement during these three series, period with El Nino, period without El Nino event, and total period. Each of these series were further split into 3 time periods, as below:

i. 10 years (2009-2018)
ii. 5 years (2014-2018)
iii. 1 year (2018).

4.3 Climate Change and Cost of Equity

4.3.1 Data and Sampling

This study mainly focuses on plantation firms where the objective of this study is to examine the determinants of the dividend pay-out of plantation firms in Malaysia. There are total 43 plantation companies listed in Bursa Malaysia as at July 2018, but this study considered data for 33 plantation companies 14 years from 2003 to 2016 due to the inaccessibility of data for some companies. Table 4.1 illustrates the sample list of firms under plantation category in Bursa Malaysia.

Secondary data are collected from various reliable sources in this study. The historical financial data of the plantation companies are gathered from Bloomberg, Thomson Reuters Datastream and Bursa Malaysia. Besides, the data of El Nino events are collected from Climate Prediction Center from USA as well as the data regarding flood collected from FloodList and Wikipedia.

4.3.2 Measurement of Variables

Dividend Policy

Dividend policy is measured by using dividend payout ratio. The dividend payout ratio is the ratio of that show the percentage of the earning paid out to shareholders in dividend. In this study, dividend payout ratio is calculated as dividend over net income, which used in previous research (e.g. Khan & Ahmad, 2017; Gill et al., 2010; Thanatawee, 2011).

$$Dividend\ Payout\ Ratio = \frac{Dividend}{Net\ Income}$$

Profitability

Profitability ratio is a term that measures business's ability of a company to generate earnings compared to all expenses and costs. Return on assets is used in this study as many scholars used ROA as the proxy of profitability (e.g. Thanatawee, 2011; Gill et al., 2010; Fakhra et al., 2013).

$$ROA = \frac{Operating\ income}{Total\ assets}$$

Leverage

Leverage ratio is a term which measures company's capital structure. Leverage ratio is calculated by using different formulas. Debt to equity ratio is used in this study to measure leverage which used in previous research (e.g. Rehman & Takumi, 2012; Gill et al., 2010, Khan & Ahmad, 2017).

$$Debt\ to\ Equity = \frac{Total\ Liabilities}{Total\ Shareholders'\ Equity}$$

Liquidity

Liquidity is the degree of a firm has current assets available to meet its short-term obligations. High liquidity means there is more assets available to be paid as dividend. Liquidity is measured by current ratio which is same as the previous studies (Khan & Ahmad, 2017; Kajola et al., 2015; Mui & Mustapha, 2016):

$$Current\ ratio = \frac{Current\ Assets}{Current\ Liabilities}$$

Firm Size

According to many previous researchers (Mui & Mustapha, 2016; Khan & Ahmad, 2017; Thanatawee, 2011), natural logarithm of the firm's total assets can be the proxy of firm size.

$$Firm\ Size = Natural\ Logarithm\ of\ Total\ Assets$$

Growth Opportunity

High growth firm earn more profit. This study uses annual sales growth as a proxy of growth opportunity of a firm as it used in previous studies as well (Zameer et al., 2013; Imran, 2011; Gill et al., 2010).

$$Growth\ Opportunity = Percentage\ Change\ in\ Total\ Sales$$

El Nino

El Nino Southern Oscillation (ENSO) is the climate event that affects the unpredictability changes of the global winds and sea surface temperature that originated in the Pacific Ocean which led to the climate changes and associated with catastrophes such as heavy rain and severe drought (Cirino et al., 2015).

El Nino is also a dummy variable in this study where value of 1 for El Nino, 0 otherwise.

Flood

Flood is the natural disaster that happens led to the economic losses in a country (Morris & Brewin, 2014). All the crop production, drainage systems, damage of soil quality, infrastructure, houses and lands incurred huge costs to recover (Piao et al., 2010).

Flood is a dummy variable in this study where value of 1 for flood, 0 otherwise.

4.3.3 Data Analysis Techniques and Model Estimations

Panel Data Analysis

To examine the relationship between independent variables and dependent variable, pooled OLS is run on the sample data to calculate the result and show the relationship between variables. Pooled OLS regression analysis is a simple linear regression model that minimizes the sum of squared error terms from the regression line to best fit the function with the sample data. A linear regression formula will be formed by placing the data of independent variable and dependent variable into the equation, while the value of y-intercept and x-coefficients will be given. The simple linear regression formula being used in this research as following:

$$Y_{it} = \alpha_i + \beta' X_{it} + \varepsilon_i \quad \text{..... (4)}$$

Where:

Y_{it}	Represent the dependent variable for the cross-section unit *i* at time *t*, where i =1….n and t = 1…..n
X_{it}	Refer to independent variable or manipulating variable where the changes of α values will influence the values changes of Y.
α_i	Refer to the intercept term
β'	Represent the slope term or gradient of the estimated regression line
ε_{it}	Denote as the residual or error term

Operational model for the general equation 4 is presented below.

$$DIV_{it} = \beta_0 + + \beta_1 ELN_{it} + \beta_2 FLD_{it} + \beta_3 PROF_{it} + \beta_4 LEV_{it} + \beta_5 LIQD_{it} + \beta_6 LnSIZE_{it} + \beta_7 GROP_{it} + \varepsilon_{it} \quad \text{..... (5)}$$

Where:

DIV	= Dividend Payout Ratio for company i in period t;
ELN	= El Nino for company i in period t;
FLD	= Flood for company i in period t;
PROF	= Return on Assets for company I in period t;
LEV	= Leverage for company i in period t;
LIQD	= Liquidity for company i in period t;
LnSIZE	= Total Assets for company i in period t;
GROP	= Growth Opportunity 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

After that, the equation 5 will be tested by using both fixed effects model and random effect model in this study. Firstly, fixed effect model undertakes that the single consequence of α_i is associated with response variable X_{it}. Secondly, random effect model presumes single consequence α_i is not associated with the response variable X_{it}. According to Gujarati and Porter (2010) and Wooldridge (2006), the error term in random effects will then become ($\mu_i + \varepsilon_{it}$), by which μi is the exact random effects component for the dataset which is parallel with ε_{it} excluding with μ_i, for each dataset there is a single draw that is considered in the regression.

Diagnostic Tests

Following diagnostic tests are considered to select the best model with check robustness of the model.

Breusch and Pagan Lagrangian Multiplier Test: Breusch and Pagan LM test is being employed in order to test the random effects model to decide pooled OLS model or random effect model is suitable to apply in this study. The interpretation of probability chibar^2 is that null hypothesis is rejected when p value is less than 0.05 and proclaimed that the data is significantly which mean random effects models is more suitable and will be chosen in this study instead of pooled OLS regression model.

Hausman Test: The Hausman specification test on the other hand examines random effects model and fixed effects model to indicates which model is more appropriate for this research. The interpretation of probability chi^2 is that null hypothesis is rejected when p value is less than 0.05 and proclaimed that fixed effects models is more suitable due to the difference in coefficients are systematic and thus will be chosen fixed effects models in this study instead of random effects model.

Variance Inflation Factors (VIF): Multicollinearity can be detected by Variance Inflation Factors (VIF) in regression analysis, where multicollinearity problem cause the variance of regression coefficient being overestimated and unfavourably influence the regression result. Hence, VIF is tested in order to calculate whether the VIF value is exceeded value 10 as it shows there is multicollinearity problem if VIF value exceeds value 10.

Wooldridge Test: Wooldridge test is employed in this study to identify whether there is autocorrelation in the panel data. Autocorrelation defines as the correlation between the values of the same variables is based on related substances. There is autocorrelation in the data if the P value is less than 0.05 where null hypothesis is rejected. Null hypothesis denotes as no autocorrelation is existed in the panel data.

Breusch-Pagan / Cook-Weisberg Test and Modified Wald Test: Heteroskedasticity problem can be checked by Breusch-Pagan / Cook-Weisberg Test and Modified Wald Test. Heteroskedasticity discusses that the variance of errors is not the same for all variables and the result of Breusch-Pagan / Cook-Weisberg Test and Modified Wald Test indicates that null hypothesis refers to the homoscedastic existed whereas alternative hypothesis shows that heteroscedasticity problem existed. Hence, is the profitability chi^2 is less than 0.05, null hypothesis is rejected.

4.4 Climate Change and Stock Market Investor's Behavior

4.4.1 Data and Sampling

Sample data were collected from online questionnaire survey through 800 questionnaires sent to the individual investor of Bursa Malaysia from Jan-Jun 2019. Although total of 320 responses were received, after initial screening and data cleaning 273 questionnaires were found useful to draw inferences. The questionnaire was finalized after a thorough revision and pretesting study.

Before design the final questionnaire a pilot test was conducted to adjust the parameters. Finally, the questionnaire was designed to collect data for empirically testable parameters. A five-point Likert-scale was used where 5 indicated highest and 1 indicated lowest value.

4.4.2 Measurement of Variables

There were five variables or constructs were measured to examine the reflections of climate change such as El Nino and flood on investors' decision-making behavior related to Agro and Plantation stock market companies in Malaysia. The detail items of these constructs are given in Appendix-I.

The construct of Investor's Awareness about Climate Change was measured by five items or parameters based on 5 scale data. Among them, most of the respondents agreed that climate change causes to decrease in productivity of crops in Malaysian agriculture and plantation sectors, but the least number of respondents agreed that climate change has overall negative impacts on Malaysian agriculture and plantation sectors. Other three remaining parameters are also very close to each other where 78% respondents believe that climate change causes to increase production cost and decrease total profitability in Malaysian agro and plantation sectors and it cause to increase the vulnerability of the overall agriculture and plantation sectors in Malaysia.

The construct of Reflection of Climate Change in Investment Decision was measured by five items or parameters based on 5 scale data. Among them, 49% of the respondents agreed that climate change will cause concerns about the financial performance of agriculture and plantation companies in Malaysian followed by 39.5% shareholders who expect to get extra risk premium for investing in agriculture and plantation company due to climate change risk. Other three remaining parameters are also very close to each other where 29.7%, 27.1% and 24.9% of respondents believe that climate change to be an issue, and causes to increase the volatility of share price and expect to get extra dividend for investing in stock market agro and plantation sector in Malaysia.

In addition to that, the construct of Company's Initiative about Climate Change in Production Level was measured by five items or parameters based on 5 scale data. Among them, 46.1%, 45.2%, 45.5%, 44.7% and 41.4% of the respondents agreed that Malaysian agriculture and plantation companies to change timing, using new technologies, the production methods like crop rotation, improve infrastructure like crop storage system, irrigation system, invest handsome amount in R&D, seek for

financial supports & subsidies from different stakeholders and agencies, and involve stakeholders at all level to adapt to climate change.

Similarly, the construct of Company's Initiative about Climate Change in Business level was measured by five items or parameters based on 5 scale data. Among them, 84.8% of the respondents agreed that Malaysian agriculture and plantation companies take enough initiative to reduce the risk, like extensive insurance coverage, hire expert, to adapt to climate change followed by 68.1%, 79.5%, 73.6% and 76.6% which agreed for companies to make changes in the accounting system like maintain reserve fund, allocate a climate budget, adjust the climatic issues in the financial dealings and reporting system, diversify asset portfolio including non-agricultural business wings and find alternative source of capital to reduce cost of capital due to climate change risk.

Lastly, the construct of Company's Initiative about Climate Change in Stock Market was measured by five items or parameters based on 5 scale data. Among them, 64.8% of the respondents agreed that Malaysian agriculture and plantation companies to properly communicate with investors and shareholders regarding climate change news. The remaining other are also very close to each other where 62.7%, 61.5%, 61.6% and 61.5% respectively believe that the concerns about shareholders expectation regarding climate change risk, thus take enough initiative, to reduce climate change induced stock price volatility and provide extra dividend to keep holding investors in spite of climate change risk.

4.4.3 Data Analysis Techniques and Model Estimations

Descriptive Analysis

The descriptive analysis is carried out to analyse the demographic information of the participants.

Correlations

The correlation among the variables were checked through Person Correlation test. This correlation test also helps to check if there is any multicollinearity problem available in the dataset.

Structural Equation Modelling

To draw inference, partial least square-structural equation modelling (SEM) method was applied based on PLS-SEM with two steps process. First step evaluates the measurement model and second step evaluate the path coefficient (Ramli, Latan, & Natea, 2018).

Model Diagnostic Test

A number of diagnostic tests, such as Internal Consistency Reliability, Indicator Reliability, Convergent Validity, and Discriminant Validity, etc., were also conducted to test the validity and reliability of data and models.

5. RESULTS AND DISCUSSIONS

This chapter analyse the results and findings of the study under four objectives and provide the discussion based on the findings of this research

5.1 Climate Change and Stock Market Volatility

5.1.1 Descriptive Statistics

The Table 5.1 portrays the complete dataset of this research. The fundamental characteristics of dependent variable and independent variables are described in descriptive statistics.

Table 5.1: Descriptive Statistics on Stock Market Volatility Variables

	Mean	**Median**	**Maximum**	**Minimum**	**Std. Dev.**
PVOL	0.372340	0.348028	0.921277	0.059251	0.185863
PAYOUT	0.386608	0.310769	1.000000	-0.264812	0.244740
DYIELD	0.040165	0.035821	0.178587	0.000171	0.027051
SIZE	20.21227	20.15540	24.12283	17.02635	1.495139
DEBT	0.261772	0.203195	0.998106	0.002886	0.205697
EVOL	0.040129	0.033370	0.233271	0.003428	0.029535
GROWTH	0.086423	0.061895	0.905637	-0.156694	0.116612
ELN	0.326840	0.000000	1.000000	0.000000	0.469567
FLD	0.311688	0.000000	1.000000	0.000000	0.463685

The outcome portrays mean, median, maximum, minimum, standard deviation values of each variable used in this study. The share price volatility's (PVOL) maximum value is 0.921277, minimum is 0.059251 and the mean value is 0.372340. It shows that there is a huge variation of 37.23% of huge variation in the share price volatility for 14 years in Malaysia's Plantation sector.

Furthermore, looking at the dividend payout ratio (PAYOUT), the mean, maximum and minimum value is 0.386608, 1 and -0.264812 respectively. It reveals that, Malaysia's Plantation companies pay out 38.66% of earnings on the face value as dividends to their shareholders on average. Thus, it is viable to state that the companies do focus on paying out dividends to the parent holders.

Besides, the dividend yield (DYIELD) seems to have a maximum value of 0.178587, minimum value of 0.000171 and the mean is 0.040165. The mean value indicates that from the time frame of 2003 to 2016, the dividend yield is increasing by 4.02% and in addition, companies paid out a huge dividend amount every year according to its stock price.

Moreover, the market value (SIZE) of the company variable's mean, maximum and minimum value are 20.21227, 24.12283 and 17.02635 respectively. According to the mean logarithm value, it denotes that Malaysia Plantation companies' market value have an average of 20.21 and possess a significant variation among other chosen companies.

Consequently, the long-term debt (DEBT) variable is recognized as the leverage figures that affects the volatility of share price. The maximum value for this variable is 0.998106, where the minimum value is 0.002886 and the mean value is 0.261772. The average value of this variable denotes that Malaysia's Plantation companies possess 26.18% long-term debt against the total asset which indicates that a smaller portion of debt is available and has been financed to operate the entities compared to assets and equities.

Then, based on the earnings volatility (EVOL) variable, the mean, maximum and minimum value is 0.040129, 0.233271 and 0.003428 respectively. The average value shows that the Plantation sector companies are able to make 3.01% of earnings before interest and taxes (EBIT) benchmarked to their total assets.

In addition, growth in assets (GROWTH) variable's maximum value is 0.905637, the minimum value is -0.156694 and consequently the mean value is 0.086423. The average value indicates that Plantation companies are growing by 8.64% which is a good sign for the listed companies.

Moreover, El Nino (ELN) variable's mean, maximum and minimum values are 0.326840, 1 and 0 as well. It shows that the El Nino event occurs 32.68% on average in these 14 years of study period. Finally, looking towards the flood (FLD) variable, it has a maximum value of 1 and minimum value of 0 and 0.311688 as mean. It reveals that the flood event occurs 31.17% on average in these 14 years of study period.

5.1.2 Correlation Analysis

Table 5.2 depicts the Pearson correlation coefficients for the variables in this study. The degree of relationship between the two variables can be described by a single number in the correlation analysis. The range of Pearson correlation coefficient is from -1.00 to 1.00 (Sekaran, 2003). The positive and negative sign indicates the directions while the value indicates the relationship strengths of the variables.

Table 5.2: Correlation Matrix of Stock Market Volatility Variables

Correlation Probability	PVOL	PAYOUT	DYIELD	SIZE	DEBT	EVOL	GROWTH	ELN	FLD
PVOL	1.000								
PAYOUT	-0.176* (0.001)	1.000							
DYIELD	-0.128* (0.005)	0.051 (0.267)	1.000						
SIZE	-0.197* (0.000)	0.159* (0.000)	-0.076 (0.100)	1.000					
DEBT	-0.151* (0.001)	0.095~ (0.040)	-0.011 (0.812)	0.005 (0.906)	1.000				
EVOL	0.136* (0.003)	-0.082^ (0.076)	0.030 (0.509)	-0.048 (0.300)	-0.124* (0.007)	1.000			
GROWTH	-0.088^ (0.057)	-0.000 (0.990)	0.000 (0.987)	-0.033 (0.468)	0.156* (0.000)	0.012 (0.792)	1.000		
ELN	0.001 (0.977)	-0.0008 (0.984)	-0.006 (0.897)	0.066 (0.155)	0.028 (0.535)	-0.011 (0.797)	-0.055 (0.231)	1.000	
FLD	0.023 (0.614)	-0.0004 (0.991)	0.002 (0.960)	-0.012 (0.789)	0.034 (0.461)	-0.020 (0.663)	-0.005 (0.904)	-0.060 (0.194)	1.000

*, ~, ^ represent significant at 1%, 5%, and 10% level, respectively

Based on Table 5.2, the correlation between the share price volatility and the dividend payout ratio is significantly and negatively correlated with a coefficient of -0.1761 and with the probability of 0.0001. The correlation is in line with Baskin (1989) study and the negative correlation shows that when there is an increase in share price volatility, then the dividend payout will decrease. Furthermore, the Pearson correlation between share price volatility and dividend yield is negatively and significantly correlated with the value of -0.1281 and with a significance level of 0.0058. The outcome is in line with Irfan and Nishat (2002) and Baskin (1989) and with the signaling hypothesis theory whereby it asserts that when the share price volatility increases, it will lead to the decrease in dividend yield. Besides, the correlation between share price volatility and the other variables for instance market value (SIZE), long-term debt and growth in assets are significantly and negatively correlated whereby the coefficient values are -0.1975, -0.1511 and -0.0883 with the probability values of 0.0000, 0.0011 and 0.0578 respectively. On the other hand, the correlation between share price volatility and earnings volatility is positively and significantly correlated with the coefficient value of 0.1364 with the probability value of 0.0033. It depicts that, when the share price increases, the earnings volatility also increases. Further, the correlation between share price volatility and the dummy variables for example El Nino and flood are insignificantly and positively correlated whereby, the coefficient values are 0.001307 and 0.023495 with the probability values of 0.9777 and 0.6145 respectively.

5.1.3 Regression Analysis

According to Table 5.3, the outcome of Pooled OLS model of Equation 1 depicts that dividend payout ratio (PAYOUT) has a significant negative relationship with share price volatility (PVOL) (probability: 0.0002). It shows that increase in dividend payout will lead to a decrease in share price volatility. Similarly, dividend yield (DYIELD) has a significant negative relationship with share price volatility (probability: 0.0093). It reveals that if there is an increase in dividend yield, then it will lead to a decrease in share price volatility.

Table 5.3: The Outcome of Pooled OLS Model on Dividend Policy

Equation	Variable	Coefficient	Std. Error	t-Statistic	Prob.
1	C	0.455148*	0.019821	22.96307	0.000
	PAYOUT	-0.129056*	0.034683	-3.72101	0.0002
	DYIELD	-0.819463*	0.313794	-2.611466	0.0093
2	C	0.923991*	0.115229	8.018704	0.000
	PAYOUT	-0.09064*	0.034241	-2.64707	0.0084
	DYIELD	-0.96656*	0.30479	-3.17124	0.0016
	SIZE	-0.02312*	0.005581	-4.14289	0.000
	DEBT	-0.10345**	0.04085	-2.53258	0.0117
	EVOL	0.68304**	0.280925	2.431395	0.0154
	GROWTH	-0.12428***	0.071264	-1.74393	0.0818
3	C	0.920088*	0.115631	7.957084	0.000
	PAYOUT	-0.09039*	0.034302	-2.63526	0.0087
	DYIELD	-0.96707*	0.305298	-3.16762	0.0016
	SIZE	-0.0232*	0.005603	-4.14055	0.000
	DEBT	-0.10485**	0.040974	-2.5589	0.0108
	EVOL	0.686437**	0.281436	2.439052	0.0151
	GROWTH	-0.12238***	0.071514	-1.71119	0.0877
	ELN	0.005846	0.0176	0.332183	0.7399
	FLD	0.011267	0.017759	0.634434	0.5261

*, **, *** indicate significant at 1%, 5%, 10% level, respectively

Based on Table 5.3, the outcome of Pooled OLS model of Equation 2, portrays that dividend payout ratio (PAYOUT) has a significant negative relationship with share price volatility (PVOL) (probability: 0.0084). It depicts that an increase in dividend payout will lead to a decrease in share price volatility. Then, dividend yield (DYIELD) has a significant negative relationship with share price volatility (probability: 0.0016). It shows that if there is an increase in dividend yield, then it will lead to a decrease in share price volatility. Furthermore, market value (SIZE) has a significant negative relationship with share price volatility (PVOL) (probability: 0.0000). It shows that an increase in market value of the company will lead to a decrease in share price volatility. Then, long-term debt (DEBT) has a significant negative relationship with share price volatility (probability: 0.0117). It depicts that if there is an increase in long-term debt, then it will lead to a decrease in share price volatility. In addition, earnings volatility (EVOL) has a significant positive relationship with share price volatility (PVOL) (probability: 0.0154). It portrays that an increase in earnings volatility will lead to an increase in share price volatility. Then, growth in assets (GROWTH) has an insignificant negative relationship with share price volatility (probability: 0.0818). It reveals that if there is an increase in asset growth, then it will lead to a decrease in share price volatility.

Based on Table 5.3, the outcome of Pooled OLS model of Equation 3 shows that dividend payout ratio (PAYOUT) has a significant negative relationship with share price volatility (PVOL) (probability: 0.0087). It depicts that an increase in dividend payout will lead to a decrease in share price volatility. Then, dividend yield (DYIELD) has a significant negative relationship with share price volatility (probability: 0.0016). It shows that if there is an increase in dividend yield, then it will lead to a decrease in share price volatility. Furthermore, market value (SIZE) has a significant negative relationship with share price volatility (PVOL) (probability: 0.0000). It shows that an increase in market value of company will lead to a decrease in share price volatility. Then, long-term debt (DEBT) has a significant negative relationship with share price volatility (probability: 0.0108). It shows that an increase in long-term debt leads to a decrease in share price volatility. In addition, earnings volatility (EVOL) has a significant positive relationship with share price volatility (PVOL) (probability: 0.0151). It portrays that an increase in earnings volatility will lead to an increase in share price volatility. Then, growth in assets (GROWTH) has an insignificant negative relationship with share price volatility (probability: 0.0877). It reveals that if there is an increase in asset growth, then it will lead to a decrease in share price volatility. Besides, El- Nino (ELN) has an insignificant positive relationship with share price volatility (PVOL) (probability: 0.7399). It portrays that an increase in El Nino will lead to an increase in share price volatility. Then, flood (FLD) has an insignificant positive relationship with share price volatility (probability: 0.5261). It reveals that an increase in flood leads to a decrease in share price volatility.

5.1.4 Diagnostic Tests

5.1.4.1 Breusch and Pagan LM Test and Hausman Test

Based to Table 5.4, the Breusch and Pagan Lagrangian Multiplier (LM) test portrays that the probability of Breusch-Pagan is 0.0055. Thus, Random effects regression can

be used rather than the Pooled OLS model since the probability of Breusch and Pagan is less than 0.05. Besides, Hausman test shows that the probability Chi^2 is 0.0564. Thus, Random effects regression model is better than Fixed effects model since the probability Chi^2 of Hausman test is more than 0.05.

Table 5.4: Breusch and Pagan LM Test and Hausman Test for Dividend Model

Equation	Test	Sig.	PVOL
1	Breusch and Pagan LM Test	Probability	0.0055
	Hausman Test	Probability Chi^2	0.0564
2	Breusch and Pagan LM Test	Probability	0.0026
	Hausman Test	Probability Chi^2	0.0334
3	Breusch and Pagan LM Test	Probability	0.0019
	Hausman Test	Probability Chi^2	0.0148

According to Table 5.4, the Breusch and Pagan Lagrangian Multiplier (LM) test reveals that the probability of Breusch-Pagan is 0.0026. Since the probability of Breusch and Pagan is less than 0.05, thus, Random effects model can be used rather than the Pooled OLS model. Further, Hausman test depicts that the probability Chi^2 is 0.0334. Therefore, Fixed effects regression model is better than Random effects model since the probability Chi^2 of Hausman test is less than 0.05.

According to Table 5.4, the Breusch and Pagan Lagrangian Multiplier (LM) test portrays that the probability of Breusch-Pagan is 0.0019. Since the probability of Breusch and Pagan is less than 0.05, thus, Random effects model can be used rather than the Pooled OLS model. Moreover, Hausman test depicts that the probability Chi^2 is 0.0148. Thus, Fixed effects regression model is better than Random effects model since the probability Chi^2 of Hausman test is less than 0.05.

5.1.4.2 Post Estimation Diagnostic Tests

The multicollinearity issue in regression analysis can be detected by Variance Inflation Factor (VIF). VIF reveals that if the mean value exceeds 10, then the regression has multicollinearity problem. According to Table 5.5, in regression Equation 1, the uncentered VIF's mean value is 3.3641. Thus, it is clearly denoting that there is no multicollinearity problem in this equation. Then, in order to check the heteroskedasticity problem in this equation, Modified Wald test was utilized. The outcome of the test depicts that the probability Chi^2 of Modified Wald test is 0.1894 which is more than 0.05. Thus, the alternate hypothesis can be rejected and concluded that the data is homoscedastic. Therefore, regression Equation 1 is free from heteroskedasticity problem.

Table 5.5: Multicollinearity Test (VIF) and Heteroskedasticity Test for Dividend Model

Equation	Test	Mean	**Prob. Chi^2**
1	Multicollinearity Test (VIF)	3.3641	-

	Heteroskedasticity Test	-	0.1894
2	Multicollinearity Test (VIF)	2.5127	-
	Heteroskedasticity Test	-	0.0709
3	Multicollinearity Test (VIF)	2.2572	-
	Heteroskedasticity Test	-	0.1091

Based on Table 5.5, the uncentered VIF's mean value is 2.5127. Thus, it shows that there is no multicollinearity problem in Equation 2 since the VIF value does not exceed 10. Then, Modified Wald test was utilized in order to check the heteroskedasticity problem in Equation 2. The result of the test shows that the probability Chi^2 of Modified Wald test is 0.0709 which is more than 0.05. Thus, the alternate hypothesis can be rejected and concluded that the data is homoscedastic. Therefore, regression Equation 2 is free from heteroskedasticity problem.

Based on Table 5.5, the uncentered VIF's mean value is 2.2572. Therefore, it denotes that there is no multicollinearity problem in Equation 3 since the VIF value does not exceed 10. Then, Modified Wald test was utilized in order to check the heteroskedasticity problem in Equation 3. The result of the test shows that the probability Chi^2 of Modified Wald test is 0.1091 which is more than 0.05. Thus, the alternate hypothesis can be rejected and concluded that the data is homoscedastic. Therefore, regression Equation 3 is free from heteroskedasticity problem.

5.2 Climate Change and Stock Market Risk Premium

5.2.1 Correlation Analysis

Correlation between KLCI and stock return in overall period, El Nino period, and non El Nino period are given in table 5.6. The table illustrated the relationship between KLCI and KLPLN. "N" represents the Observation dates count. El Nino period is identified with NINDSOIA Index, which any observation index with a reading lower than -8, it will be classified as El Nino period. During these 3-time series, 10years time series correlation has very minimal differs between El Nino period compared to full term period, which was within 0.687 to 0.689. Result shown the bigger differences when it moves to the 5 years' time series, where KLPLN (Plantation Index) deviates away from KLCI, range from 0.577 to 0.693.

Table 5.6: Correlation of KLCI Index versus KLPLN Index

INDEX	Measurement	KLCI RETURN								
		TOTAL PERIOD			EL NINO			Non EL NINO		
		10Y	5Y	1Y	5Y	1Y	10Y	10Y	5Y	1Y
KLPLN Return	Pearson	.687**	.625**	.553**	.693**	.789	.686**	.689**	.577**	.552**
	Sig. (2-tailed)	.000	.000	.000	.000	.211	.000	.000	.000	.000
	N	2541	1238	195	345	4	485	2056	893	191

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

There were 485 days are identified as El Nino period out of 10 years time that is around 19% of the total 2,541 days. In case of 5 years time series, 27.8% of the days,

which is 345 days El Nino period. In case of 1year time series, only 4 days are observed as El Nino.

Table 5.7: Correlation between KLCI Index and Individual Stock Return

26 Companies Corrlation is significant at the 0.01 level (2-tailed)			
1	AAB return	21	MPI return
3	CWG return	25	PPB return
5	GENP return	26	RRE return
6	GLBH return	27	RSAW return
8	HAPL return	28	SBR return
10	IJMP return	29	SHL return
11	IKEN return	30	**SIME return***
13	**IOI return***	31	SOP return
14	JT return	32	SPLB return
15	KHP return	33	TDM return
16	KIML return	34	THP return
17	KLK return	35	TSH return
20	MHC return	36	UMR return
11 Companies Corrlation is significant at the 0.05 level (2-tailed)			
2	BLDP return	19	KWAN return
4	FEH return	22	NPC return
7	GOP return	23	NSOP return
9	HARN return	24	PLS return
12	INNO return	37	UPL return
18	KLR return		

From the 37 plantation firms that is selected in this study, 26 companies turn out to show significant (2-Tailed) value less than 0.05, which could concluded that there is a statistically significant correlation between KLCI and the firm's stock price regardless period (Table 5.7). IOI Corporation Bhd. (Company 13) and SIME DARBY Bhd. (Company 30) have shown positive correlation for more than 50% with KLCI. However, there are 11 companies which do not show statistically significant correlation with KLCI, during the El Nino Period. The return of stock for 5Years and 1Year are not having statistical correlation with KLCI, and mostly with very weak correlation. It could be due to the short time series. Details individual correlation with significant value for three time period – 1, 5, and 10 years – as well as three series- El Nino period, non-El Nino period and total period – are given in the Appendix II.

5.2.2 Stock Market Risk Analysis

The result didn't support the hypothesis that market risk (BETA) of El Nino period should be larger than Non-El Nino period. The stock market volatility during El Nino period wasn't as expected (Appendix III). Only 7 Companies – GOLDEN LAND BERHAD, JAYA TIASA HLDGS BHD, PINEHILL PACIFIC BHD, SIN HENG

CHAN BHD, SIME DARBY BHD, SARAWAK PLANTATION BHD, TDM BERHAD – has more volatile stock price movement in the time of El Nino, as listed below (Table 5.8).

Table 5.8: Summary of BETA Differentials

	El Nino Vs. Non El Nino period	Number of Companies			
		10 years Beta	5 years Beta	1 years Beta	Average
Risk	El Nino period> Non El Nino Period	7	19	18	14.7
	El Nino period < Non El Nino Period	30	18	19	22.3
Return	El Nino period> Non El Nino Period	7	16	18	13.7
	El Nino period < Non El Nino Period	30	21	19	23.3
Risk Premium	El Nino period> Non El Nino Period	22	25	12	19.7
	El Nino period < Non El Nino Period	15	12	25	17.3

For the 5 Years and 1Year time series, the BETA of stock market movement for El Nino and Non-El Nino period is quite even, no huge deviation on response from stockholder for El Nino period. From the analysis, it was found that El Nino Index is a not available to public for a daily interval. Not all El Nino make it to the headlines, and the information about El Nino that available to public has to be from Australia BoM, for a monthly statistic. This could explain the lags in the investor information related to El Nino, and thus didn't have a strong influence to the stock market movement as we anticipated. The details BETA calculation for all three period and for three series are given in Appendix III.

5.2.3 Stock Market Return Analysis

This part of analysis will separate the agricultures, grouping by the result of stock market return. The result is examined and further tabulated into three categories. As market BETA (Volatility of the stock price) was not observed, there is the first group of companies (Group A) with higher return in the time of El Nino. They have consistently higher return in 3 different time series which is a great opportunity for arbitraging, as the stock market movement is in the favor of investor in the El Nino Period. Group B will be the companies that have higher return in at least 1 or 2 of the time series, and Group C will be consisted of companies with similar return regardless of the period.

Table 5.9: Stocks with Higher Return in the El Nino Period

A	FIRMS	PERIOD	10YEARS	5YEARS	1YEAR
6	GLBHD	All Return	0.026%	-0.023%	-0.116%
		El-Nino Period	0.106%	0.137%	0.278%
		Non El-Nino Period	0.007%	-0.086%	-0.124%
			Higher Return	Higher Return	Higher Return
7	GOPENG	All Return	0.057%	0.062%	-0.035%
		El-Nino Period	0.218%	0.225%	0.000%
		Non El-Nino Period	0.019%	-0.001%	-0.036%
			Higher Return	Higher Return	Higher Return
10	IJM	All Return	0.022%	-0.019%	-0.047%
		El-Nino Period	0.122%	0.087%	0.311%
		Non El-Nino Period	-0.002%	-0.060%	-0.055%
			Higher Return	Higher Return	Higher Return
11	INCKEN	All Return	0.066%	-0.005%	0.000%
		El-Nino Period	0.071%	0.015%	0.187%
		Non El-Nino Period	0.064%	-0.013%	-0.004%
			Higher Return	Higher Return	Higher Return

There were 4 companies showing higher return of stock during the El Nino period, with the distinctive differences and higher earnings comparatively especially in 10 Years' time series (Table 5.9). Golden Land Berhad (GLBHD, 6) stock performed peculiarly better in 1Year, while IJM stock (IJM, 10) was strong in 5Years time series, under El Nino period.

Table 5.10: Stocks with Mixed Cases of Higher Return in the El Nino Period

B	FIRMS	PERIOD	10YEARS	5YEARS	1YEAR
1	AASIA	All Return	0.044%	0.029%	-0.010%
		El-Nino Period	0.015%	0.045%	0.000%
		Non El-Nino Period	0.050%	0.023%	-0.010%
				Higher Return	Higher Return
2	BLDPLNT	All Return	0.050%	-0.017%	-0.086%
		El-Nino Period	0.048%	0.041%	0.000%
		Non El-Nino Period	0.050%	-0.040%	-0.087%
				Higher Return	Higher Return
3	CEPT	All Return	0.029%	-0.014%	-0.084%
		El-Nino Period	0.009%	-0.006%	0.180%
		Non El-Nino Period	0.034%	-0.017%	-0.090%
				Higher Return	Higher Return
5	GENTING	All Return	0.047%	-0.006%	-0.047%
		El-Nino Period	0.028%	0.001%	-0.295%
		Non El-Nino Period	0.051%	-0.009%	-0.042%
				Higher Return	
9	HARNLEN	All Return	0.034%	-0.054%	0.017%
		El-Nino Period	-0.018%	-0.037%	0.000%
		Non El-Nino Period	0.047%	-0.060%	0.017%
				Higher Return	
14	JAYA	All Return	0.026%	-0.073%	-0.237%
		El-Nino Period	0.015%	-0.073%	0.023%
		Non El-Nino Period	0.028%	-0.073%	-0.243%
					Higher Return
15	KRETAM	All Return	0.051%	-0.022%	-0.069%
		El-Nino Period	0.079%	0.084%	-0.283%
		Non El-Nino Period	0.044%	-0.063%	-0.065%
			Higher Return	Higher Return	
16	KMLOONG	All Return	0.047%	0.044%	-0.030%
		El-Nino Period	0.061%	0.029%	-0.546%
		Non El-Nino Period	0.043%	0.050%	-0.020%
			Higher Return		
17	KLK	All Return	0.048%	0.005%	0.001%
		El-Nino Period	0.044%	0.030%	0.042%
		Non El-Nino Period	0.050%	-0.005%	0.000%
				Higher Return	Higher Return
20	MHC	All Return	0.038%	-0.016%	-0.086%
		El-Nino Period	0.022%	-0.021%	0.540%
		Non El-Nino Period	0.042%	-0.015%	-0.099%
					Higher Return
21	MALPAC	All Return	0.047%	0.128%	0.007%
		El-Nino Period	-0.010%	0.013%	0.090%
		Non El-Nino Period	0.060%	0.173%	0.005%
					Higher Return
22	NPC	All Return	0.015%	-0.008%	-0.030%
		El-Nino Period	-0.001%	-0.008%	1.216%
		Non El-Nino Period	0.019%	-0.007%	-0.056%
					Higher Return

Table 5.10 (Continued): Stocks with Mixed Cases of Higher Return in the El Nino Period

B	FIRMS	PERIOD	10YEARS	5YEARS	1YEAR
23	NSOP	All Return	0.010%	-0.031%	-0.030%
		El-Nino Period	-0.018%	-0.074%	0.342%
		Non El-Nino Period	0.017%	-0.015%	-0.038%
					Higher Return
27	RSAWIT	All Return	0.017%	-0.088%	-0.263%
		El-Nino Period	-0.012%	-0.015%	0.024%
		Non El-Nino Period	0.024%	-0.117%	-0.269%
				Higher Return	Higher Return
29	SHCHAN	All Return	0.098%	-0.003%	-0.083%
		El-Nino Period	0.057%	0.027%	-3.788%
		Non El-Nino Period	0.107%	-0.015%	-0.005%
				Higher Return	
30	SIME DARBY	All Return	0.038%	0.024%	0.103%
		El-Nino Period	0.000%	-0.042%	0.315%
		Non El-Nino Period	0.047%	0.050%	0.098%
					Higher Return
32	SWKPLNT	All Return	0.014%	-0.018%	0.010%
		El-Nino Period	-0.072%	-0.115%	0.806%
		Non El-Nino Period	0.034%	0.019%	-0.007%
					Higher Return
33	TDM	All Return	0.038%	-0.078%	-0.255%
		El-Nino Period	0.024%	-0.038%	-0.362%
		Non El-Nino Period	0.041%	-0.094%	-0.252%
				Higher Return	
35	TSH	All Return	0.050%	-0.036%	-0.184%
		El-Nino Period	-0.011%	-0.055%	0.217%
		Non El-Nino Period	0.064%	-0.028%	-0.192%
					Higher Return
36	UMCCA	All Return	0.021%	-0.011%	-0.041%
		El-Nino Period	0.020%	-0.004%	0.370%
		Non El-Nino Period	0.021%	-0.014%	-0.049%
				Higher Return	Higher Return
37	UTDPLT	All Return	0.044%	0.009%	-0.015%
		El-Nino Period	0.045%	0.014%	-0.167%
		Non El-Nino Period	0.044%	0.006%	-0.012%
			Higher Return	Higher Return	

Group B are the companies that have higher return in at least 1 or 2 in the time series. Kretam Holding stock (KRETAM, 15) soars in both El Nino periods under 10Years and 5 Years' time series, while Kuala Lumpur Kepong (KLK,17) stock response better in El Nino time for 5 years and 1Year time series (Table 5.10).

Table 5.11: Stocks with Lower Return in the El Nino Period

C	FIRMS	PERIOD	10YEARS	5YEARS	1YEAR
4	FAREST	All Return	0.043%	0.052%	0.195%
		El-Nino Period	0.023%	0.008%	0.000%
		Non El-Nino Period	0.048%	0.068%	0.199%
			X	X	X
8	HSPLNT	All Return	0.025%	-0.009%	-0.065%
		El-Nino Period	-0.024%	-0.023%	-0.783%
		Non El-Nino Period	0.036%	-0.004%	-0.050%
			X	X	X
12	INNO	All Return	0.087%	0.042%	-0.180%
		El-Nino Period	0.000%	0.007%	-0.962%
		Non El-Nino Period	0.108%	0.056%	-0.164%
			X	X	X
13	IOI	All Return	0.027%	0.004%	0.004%
		El-Nino Period	0.009%	0.001%	-0.039%
		Non El-Nino Period	0.031%	0.005%	0.005%
			X	X	X
18	KLUANG	All Return	0.049%	0.034%	0.095%
		El-Nino Period	-0.005%	-0.010%	0.000%
		Non El-Nino Period	0.062%	0.051%	0.097%
			X	X	X
19	KWANTAS	All Return	-0.002%	-0.038%	-0.116%
		El-Nino Period	-0.045%	-0.066%	-0.820%
		Non El-Nino Period	0.009%	-0.028%	-0.102%
			X	X	X
24	PLS	All Return	0.052%	-0.027%	0.072%
		El-Nino Period	-0.043%	-0.072%	-2.296%
		Non El-Nino Period	0.074%	-0.009%	0.121%
			X	X	X
25	PINEPAC	All Return	0.135%	0.204%	1.188%
		El-Nino Period	-0.085%	-0.064%	-0.773%
		Non El-Nino Period	0.187%	0.307%	1.230%
			X	X	X
26	RVIEW	All Return	0.044%	-0.004%	-0.004%
		El-Nino Period	0.008%	-0.070%	-1.042%
		Non El-Nino Period	0.052%	0.022%	0.017%
			X	X	X
31	SOP	All Return	0.028%	-0.053%	-0.166%
		El-Nino Period	-0.028%	-0.059%	-0.496%
		Non El-Nino Period	0.041%	-0.051%	-0.159%
			X	X	X
28	SABGAN	All Return	0.031%	0.012%	0.058%
		El-Nino Period	0.020%	-0.019%	-0.760%
		Non El-Nino Period	0.034%	0.024%	0.076%
			X	X	X
34	TH	All Return	-0.002%	-0.070%	-0.254%
		El-Nino Period	-0.085%	-0.146%	-1.241%
		Non El-Nino Period	0.018%	-0.040%	-0.233%
			X	X	X

There are also some stocks with adverse performance, which is much lower return, for example like IOI Corporation (IOI, 13) and Pinehill Pacific (PINEPAC, 25) during the El Nino period (Table 5.11).

5.2.4 Stock Market Risk Premium Analysis

The investigation show more of the firms are having higher risk premium during the time of El Nino, more than the total count of companies with a better return of stock. There are 8 firms that come with higher cost of stock during El Nino period (Table 5.12).

Table 5.12: Stocks with Higher Risk Premium in the El Nino Period

A	FIRMS	PERIOD	10YEARS	5YEARS	1YEAR
3	CEPT	All Return	-0.001%	-0.012%	-0.087%
		El-Nino Period	0.011%	0.025%	-0.019%
		Non El-Nino Period	-0.003%	-0.027%	-0.089%
			Higher Premium	Higher Premium	Higher Premium
6	GLBHD	All Return	-0.004%	-0.022%	-0.118%
		El-Nino Period	0.108%	0.168%	0.079%
		Non El-Nino Period	-0.031%	-0.096%	-0.122%
			Higher Premium	Higher Premium	Higher Premium
10	IJM	All Return	-0.008%	-0.018%	-0.050%
		El-Nino Period	0.124%	0.118%	0.112%
		Non El-Nino Period	-0.039%	-0.070%	-0.053%
			Higher Premium	Higher Premium	Higher Premium
14	JAYA	All Return	-0.004%	-0.071%	-0.240%
		El-Nino Period	0.017%	-0.042%	-0.176%
		Non El-Nino Period	-0.009%	-0.083%	-0.241%
			Higher Premium	Higher Premium	Higher Premium
20	MHC	All Return	0.008%	-0.015%	-0.089%
		El-Nino Period	0.024%	0.010%	0.341%
		Non El-Nino Period	0.005%	-0.025%	-0.098%
			Higher Premium	Higher Premium	Higher Premium
22	NPC	All Return	-0.015%	-0.006%	-0.033%
		El-Nino Period	0.001%	0.023%	1.017%
		Non El-Nino Period	-0.019%	-0.017%	-0.055%
			Higher Premium	Higher Premium	Higher Premium
27	RSAWIT	All Return	-0.013%	-0.087%	-0.265%
		El-Nino Period	-0.010%	0.016%	-0.175%
		Non El-Nino Period	-0.014%	-0.127%	-0.267%
			Higher Premium	Higher Premium	Higher Premium
36	UMCCA	All Return	-0.009%	-0.009%	-0.043%
		El-Nino Period	0.022%	0.027%	0.171%
		Non El-Nino Period	-0.016%	-0.023%	-0.048%
			Higher Premium	Higher Premium	Higher Premium

To have a more comparatively result, Kretam Holding stock (KRETAM, 15) and Kuala Lumpur Kepong (KLK, 17), which has better return during the same time series in El Nino period, also shown the result as higher risk premium in the respective time series, which are in lines with the theory of higher risk, comes higher return (Table 5.13).

Table 5.13: Stocks with Mixed Cases of Higher Risk Premium in the El Nino Period

B	FIRMS	PERIOD	10YEARS	5YEARS	1YEAR
1	AASIA	All Return	0.014%	0.031%	-0.012%
		El-Nino Period	0.017%	0.076%	-0.199%
		Non El-Nino Period	0.013%	0.013%	-0.009%
			Higher Premium	Higher Premium	
2	BLDPLNT	All Return	0.020%	-0.016%	-0.088%
		El-Nino Period	0.050%	0.072%	-0.199%
		Non El-Nino Period	0.013%	-0.050%	-0.086%
			Higher Premium	Higher Premium	
4	FAREST	All Return	0.013%	0.053%	0.192%
		El-Nino Period	0.025%	0.039%	-0.199%
		Non El-Nino Period	0.010%	0.058%	0.200%
			Higher Premium		
5	GENTING	All Return	0.017%	-0.005%	-0.050%
		El-Nino Period	0.030%	0.032%	-0.494%
		Non El-Nino Period	0.014%	-0.019%	-0.041%
			Higher Premium	Higher Premium	
7	GOPENG	All Return	0.027%	0.064%	-0.038%
		El-Nino Period	0.220%	0.257%	-0.199%
		Non El-Nino Period	-0.018%	-0.010%	-0.035%
			Higher Premium	Higher Premium	
8	HSPLNT	All Return	-0.005%	-0.008%	-0.067%
		El-Nino Period	-0.022%	0.008%	-0.982%
		Non El-Nino Period	-0.001%	-0.014%	-0.048%
				Higher Premium	
9	HARNLEN	All Return	0.004%	-0.052%	0.014%
		El-Nino Period	-0.016%	-0.006%	-0.199%
		Non El-Nino Period	0.009%	-0.070%	0.019%
				Higher Premium	
11	INCKEN	All Return	0.036%	-0.004%	-0.003%
		El-Nino Period	0.073%	0.046%	-0.012%
		Non El-Nino Period	0.027%	-0.023%	-0.003%
			Higher Premium	Higher Premium	
13	IOI	All Return	-0.003%	0.006%	0.002%
		El-Nino Period	0.011%	0.032%	-0.238%
		Non El-Nino Period	-0.006%	-0.004%	0.007%
			Higher Premium	Higher Premium	
15	KRETAM	All Return	0.021%	-0.021%	-0.072%
		El-Nino Period	0.081%	0.115%	-0.482%
		Non El-Nino Period	0.006%	-0.073%	-0.063%
			Higher Premium	Higher Premium	
16	KMLOONG	All Return	0.017%	0.045%	-0.033%
		El-Nino Period	0.063%	0.060%	-0.745%
		Non El-Nino Period	0.006%	0.040%	-0.018%
			Higher Premium	Higher Premium	
17	KLK	All Return	0.018%	0.007%	-0.002%
		El-Nino Period	0.046%	0.061%	-0.157%
		Non El-Nino Period	0.012%	-0.015%	0.001%
			Higher Premium	Higher Premium	

Table 5.13 (Continued): Stocks with Mixed Cases of Higher Risk Premium in the El Nino Period

B	FIRMS	PERIOD	10YEARS	5YEARS	1YEAR
19	KWANTAS	All Return	-0.032%	-0.037%	-0.119%
		El-Nino Period	-0.043%	-0.035%	-1.019%
		Non El-Nino Period	-0.029%	-0.037%	-0.100%
				Higher Premium	
23	NSOP	All Return	-0.020%	-0.030%	-0.033%
		El-Nino Period	-0.016%	-0.043%	0.144%
		Non El-Nino Period	-0.021%	-0.025%	-0.036%
			Higher Premium		Higher Premium
28	SABGAN	All Return	0.001%	0.013%	0.056%
		El-Nino Period	0.022%	0.012%	-0.959%
		Non El-Nino Period	-0.004%	0.014%	0.077%
			Higher Premium		
29	SHCHAN	All Return	0.068%	-0.002%	-0.086%
		El-Nino Period	0.059%	0.058%	-3.987%
		Non El-Nino Period	0.070%	-0.025%	-0.004%
				Higher Premium	
30	SIME DARBY	All Return	0.008%	0.026%	0.100%
		El-Nino Period	0.003%	-0.011%	0.116%
		Non El-Nino Period	0.009%	0.040%	0.100%
					Higher Premium
31	SOP	All Return	-0.002%	-0.051%	-0.169%
		El-Nino Period	-0.026%	-0.028%	-0.695%
		Non El-Nino Period	0.004%	-0.061%	-0.158%
				Higher Premium	
32	SWKPLNT	All Return	-0.016%	-0.017%	0.007%
		El-Nino Period	-0.070%	-0.083%	0.608%
		Non El-Nino Period	-0.003%	0.009%	-0.005%
					Higher Premium
33	TDM	All Return	0.008%	-0.077%	-0.257%
		El-Nino Period	0.026%	-0.007%	-0.561%
		Non El-Nino Period	0.004%	-0.104%	-0.251%
			Higher Premium	Higher Premium	
35	TSH	All Return	0.020%	-0.034%	-0.187%
		El-Nino Period	-0.009%	-0.024%	0.018%
		Non El-Nino Period	0.027%	-0.038%	-0.191%
				Higher Premium	Higher Premium
37	UTDPLT	All Return	0.014%	0.010%	-0.018%
		El-Nino Period	0.047%	0.045%	-0.366%
		Non El-Nino Period	0.006%	-0.003%	-0.011%
			Higher Premium	Higher Premium	

Table 5.14: Stocks with Lower Risk Premium in the El Nino Period

C	FIRMS	PERIOD	10YEARS	5YEARS	1YEAR
18	KLUANG	All Return	0.019%	0.035%	0.093%
		El-Nino Period	-0.003%	0.021%	-0.199%
		Non El-Nino Period	0.024%	0.041%	0.099%
			X	X	X
12	INNO	All Return	0.057%	0.044%	-0.183%
		El-Nino Period	0.002%	0.038%	-1.160%
		Non El-Nino Period	0.070%	0.046%	-0.163%
			X	X	X
21	MALPAC	All Return	0.017%	0.130%	0.005%
		El-Nino Period	-0.008%	0.044%	-0.108%
		Non El-Nino Period	0.023%	0.163%	0.007%
			X	X	X
24	PLS	All Return	0.022%	-0.025%	0.069%
		El-Nino Period	-0.041%	-0.041%	-2.495%
		Non El-Nino Period	0.037%	-0.019%	0.123%
			X	X	X
25	PINEPAC	All Return	0.105%	0.205%	1.186%
		El-Nino Period	-0.083%	-0.032%	-0.971%
		Non El-Nino Period	0.150%	0.297%	1.231%
			X	X	X
26	RVIEW	All Return	0.014%	-0.002%	-0.007%
		El-Nino Period	0.010%	-0.039%	-1.241%
		Non El-Nino Period	0.015%	0.012%	0.019%
			X	X	X
34	TH	All Return	-0.032%	-0.068%	-0.256%
		El-Nino Period	-0.083%	-0.115%	-1.440%
		Non El-Nino Period	-0.020%	-0.050%	-0.232%
			X	X	X

The companies that didn't indicate higher risk premium in all times series regardless of the period are given in Table 5.14. The empirical observations of this study imply that there are firms with higher risk premium and bundled together with higher return. From the result, all the 4 firms that shown higher return in Table 4.8 has higher risk premium too in the El Nino time. There are many more firms in this study has shown higher return during El Nino time, without charges of higher premium. These are the firms that worth to arbitrage, given example such as Inch Kenneth Kajang Rubber (INCKEN, 11), in the 1year period.

5.3 Climate Change and Cost of Equity

5.3.1 Descriptive Statistics

The descriptive statistics of the dataset in this study shows that mean value of DIV is 26.3825 where minimum and maximum values are 0.0000 and 99.8100 respectively which show that the average of dividend payout ratio that Malaysian plantation companies able to distribute is 26.38 percent. Besides, the mean value of 5.3580 of PROF indicates that average Malaysian agriculture companies able to manage the return on assets at 5.36 percent. Table 5.15 also shows the average financial leverage and liquidity of the firms are 57.2575 and 8.3348 respectively where indicates that the average of firms' total debt to equity is 57.26 percent as well as the firms have 8.3348

times ability to meet their short-term obligations. Furthermore, growth opportunity's mean value of 0.1869 represents the average sales of Malaysian plantation firms increasing by 18.69 percent each year. Lastly, the mean of El Nino is 0.2857 and the mean of flood is 0.3571.

Table 5.15: Descriptive Statistics for Climate Change and Cost of Equity

Variables	Number of Observations	Mean	Standard Deviation	Min	Max
DIV	462	26.3825	22.8762	0.0000	99.8100
ELN	462	0.2857	0.4522	0.0000	1.0000
FLD	462	0.3571	0.4797	0.0000	1.0000
PROF	462	5.3580	5.6757	-15.110	39.670
LEV	462	57.2575	78.8195	-175.82	446.88
LIQD	462	8.3348	19.1345	0.0262	252.73
LnSIZE	462	17.8268	6.0750	3.1781	23.890
GROP	462	0.1869	0.6658	-0.9845	7.2226

5.3.2 Correlation

In the correlation matrix (Table 5.16), the firm size and growth opportunity are inversely related to dividend payout ratio. On the other hand, the profitability, financial leverage, liquidity, El Nino and flood are positively related to dividend payout ratio. Besides, the firm size, growth opportunity, financial leverage and liquidity are positively related to El Nino, but profitability is negatively related to El Nino. The flood also has negative relationship with the profitability and financial leverage but positively related to other variables. Besides, there is no multicollinearity existed as none of the correlation is above 0.8 based on Table 5.16.

Table 5.16: Correlations Matrix for Climate Change and Cost of Equity

	DIV	PROF	LEV	LIQD	LnSIZE	GROP	ELN	FLD
DIV	1.000	0.014	0.216*	0.086	-0.102*	-0.067	0.189*	0.041
		(0.759)	(0.000)	(0.066)	(0.029)	(0.154)	(0.000)	(0.384)
PROF		1.00	0.106*	0.007	-0.212*	-0.084	-0.1678*	-0.171*
			(0.023)	(0.879)	(0.000)	(0.070)	(0.000)	(0.001)
LEV			1.00	0.253*	-0.285*	-0.010	0.028	-0.010
				(0.000)	(0.000)	(0.833)	(0.558)	(0.821)
LIQD				1.000	-0.148*	-0.022	0.005	0.004
					(0.001)	(0.633)	(0.908)	(0.933)
LnSIZE					1.000	0.082	0.029	0.001
						(0.077)	(0.536)	(0.975)
GROP						1.000	0.023	0.008
							(0.623)	(0.869)
ELN							1.000	0.189*
								(0.000)
FLD								1.000

5.3.3 Regression Analysis

Pooled OLS, Fixed Effects and Random Effects

From the analysis of LM test and Hausman test, fixed effects model affirmed as the most suitable model (Table 5.18). However, fixed effects model with robust standard error is implemented at the final stage of analysis in order to fix the heteroscedasticity problem.

Regression analysis reveals a positive and statistically significant relationship between the El Nino and dividend payout ratio using the whole three models at 1 percent significance level whereby it strongly proves that the existence of El Nino will increase the firm's dividend payout ratio (Table 5.17).

Table 5.17: Output of Pooled OLS, Fixed Effects, Random Effects and Robust Fixed Effects Model

VARIABLES	Pooled OLS	Fixed Effects	Random Effects	Robust Fixed Effects Model
ELN	9.432804***	6.280438***	8.923346***	6.280438***
	(2.334366)	(2.02675)	(1.932767)	(1.779454)
FLD	0.4805392	0.276349	-0.13456	0.2763489
	(2.201242)	(1.798976)	(1.81784)	(1.411701)
PROF	0.052227	-0.21749	-0.26918	-0.2174888
	(0.190371)	(0.186337)	(0.181926)	(0.1419681)
LEV	0.0553035***	0.0138	0.0309765*	0.0137997
	(0.0139606)	(0.02136)	(0.018722)	(0.0290379)
LIQD	0.0347087	0.1080757*	0.083843	0.1080757
	(0.0556162)	(0.059842)	(0.057359)	(0.1111978)
LnSIZE	-0.1514687	7.045309***	-0.0077	7.045309*
	(0.1806056)	(1.918736)	(0.407972)	(3.508912)
GROP	-2.196576	-1.811563	-2.05293	-1.811563
	(1.549384)	(1.297919)	(1.310145)	(1.411216)
Cons	22.89091***	-101.2932***	23.37186***	-101.2932
	(4.151086)	(34.34975)	(8.183235)	(63.12639)
Observations	462	462	462	462
Number of Company	33	33	33	33
F / Chi^2 Value	6.25	7.02	25.95	5.71
Prob > F / Chi^2	0.0000	0.0000	0.0000	0.0002

Note: The values in parentheses are standard errors. ***, **and * denote significance level at 1%, 5% and 10% respectively.

The pooled OLS and fixed effects models give a positively relationship between the variables of flood and dividend payout ratio, but random effects model shows a negatively relationship between flood and dividend payout ratio. Nonetheless, all three models indicate that there is no statistically significant relationship between the existence of flood and dividend payout ratio.

Profitability is positively related to dividend payout ratio in pooled OLS where the profit of a firm increase will lead the dividend payout ratio increase. Besides, it is negatively related to dividend payout ratio in fixed effects and random effects models which demonstrates that the increase of a firm's profit will decrease the dividend payout ratio. However, it is statistically insignificant related to dividend payout ratio in all three models pooled OLS, fixed effects and random effects.

Financial leverage of a firm is positive and statistically significant with dividend payout ratio in pooled OLS at 1 percent significance level and 10 percent significance level in random effects model. It shows that the more the financial leverage managed by a company, the more dividend payout ratio will be given. However, financial leverage is statistically insignificant related to dividend payout ratio in fixed effects model.

Liquidity is positively associated with dividend payout ratio in all pooled OLS, fixed effects and random effects models where the increase in firm's liquidity will increase the dividend payout ratio. However, there is only fixed effects model shows that liquidity is significantly related to dividend payout ratio at 10 percent significance level and it is statistically insignificantly with dividend payout ratio in pooled OLS and random effects models.

Pooled OLS and random effects models show that the firm size has negative relationship with dividend payout ratio which indicates that the increase in firm size will lead to decrease in dividend payout ratio, but it is not statistically significant related. However, firm size is significant positively associated in fixed effects model at 1 percent significance level, meaning that the increase in firm size will lead to an increasing in firm's dividend payout ratio.

Growth opportunity is not statistically significant and negatively associated with dividend payout ratio in fixed effects models. In addition, pooled OLS and random effects models also demonstrates negative linkage between growth opportunity and dividend payout ratio, but no significant relationship exists between growth opportunity and dividend payout ratio as well.

Fixed Effect Model with Robust Standard Error

The result obtained from robust fixed effects model discloses a significant positive relationship between El Nino and dividend payout ratio at 1 percent significance level. It indicates each El Nino event will increase 6.2804 units in dividend payout ratio. This is because high dividend payout able to stabilize the fluctuation of stock price by adding good impression to investors. Investors would like to hold the shares and receive the high dividend payment. Hence, the selling of stocks at low price can be reduced which maintain the market value of company. In addition, high dividend is distributed to investors after the event of El Nino in order to compensate the risk of investors who are holding the shares as well. Thus, dividend policy makers are able to manage one of the risks of company confronting El Nino event by distributing high dividend to investors according to the result above.

The finding shows insignificant relationship between flood and dividend payout ratio which mean flood is not the important factor in determining dividend payout ratio.

This might because the major crop production is palm oil and the level of damage of crop production caused by flood is considered not that high due to the palm trees able to tolerant with the flooding at less than a week (Iles, 1993). Moreover, in Malaysia Palm Oil trees grow in hilly areas which is not much affected by flood. Besides, palm trees have rambling roots, a wiry trunk and frond shape leaves that able to secure them to stand stable in a place and avoid being pulled over by grabbing of water. Thus, the production of palm oil and profitability would not be affected much if the flooding is less than seven days. Flood might have impact on the production and profitability of plantation firms if the event is more than a week.

The profitability of firm has no significant relationship with dividend payout ratio which shows that profitability is not a crucial determinant in dividend payout decision. This result is in line with Mui and Mustapha (2016) and Rafique (2012) who also found an insignificant negative association between profitability and dividend payout. This may be the reason that company pay dividend in case of low profit; suppose due to climatic change event company need to pay constant or high dividend from reserve money to maintain stability in share price in stock market. However, Rafique (2012) mentioned that firms in developing countries tend to retain the earning and not implement the stable dividend policy as firms in developed countries. This relationship can mean that when firms share value increases, they adjust their dividend decision and focused on re-investing the profit.

Financial leverage of a firm is positively related to dividend payout ratio but the relationship between leverage and dividend payout ratio is insignificant. This finding is identical with Mui and Mustapha (2016), King'wara (2015), Mirza and Azfa (2010), Ahmed and Javid (2009), Abor and Bokpin (2010) and Rafique (2012) where they also found leverage is not significant factor influencing the dividend payout. Positive sign can be explained that the company incurs more debt to finance the assets instead of diluting the percentage of ownership and able to generate more income and cash flow to distribute dividend.

Interestingly, the impact of liquidity on dividend payout ratio is positive but not statistically significant. The findings can be deduced that liquidity has a crucial role on firms' investment allowing them to fulfill their short-term obligations. This is in support by the studies of Fakhra et al. (2013), Kajola et al. (2015), Naeem and Nasr (2007) that explain that firm with more liquidity does not mean that dividend payment will be paid higher to the investors due to excess of cash. Hence, the dividend payment is not based on the firm's availability of liquidity as firm's liquidity is not a strong determinant of dividend payment stated in the result of this study.

Firm size is significantly and positively associated with dividend payout ratio at 10 percent significance level which indicates that every 1 unit of financial size of a firm increase will result 7.0453 unit of dividend payout ratio of the firm to increase. This finding is parallel with the result of Rafique (2012), Thanatawee (2011), El-Essa (2012), Al-Kuwari (2009), Chen and Dhiensiri (2009), Al-Malkawi et al. (2013), Al-Nawaiseh (2013), Kajola et al. (2015), Mui and Mustapha (2016), Issa (2015) and Jabbouri (2016) where explains that larger firm tends to pay more dividend to the investors. This signifies the size of firms is crucial to be considered by investors before taking investment decision. The larger firms are mostly diversified applying advanced

technologies in their production and operations. That is why they may cover climatic change relevant cost and losses by diversifying business portfolio.

Furthermore, the relationship between growth opportunity and dividend payout ratio is not statistically significant. Negative linkage can be explained that growing company tend to retain the earning for business expansion whereas mature company would like to pay more dividend to investors. This finding is consistent with the finding of Kajola et al. (2015), Rafique (2012), Al-Malkawi et al. (2013), Ahmed and Javid (2009), and Zameer et al. (2013) who also revealed the relationship between growth opportunity and dividend payout ratio is insignificant.

5.3.4 Model Diagnostic Test

Table 5.18 demonstrates the finding of LM test and Hausman test. According to the Table 5.18, prob>chibar^2 of Breusch and Pagan LM test is less than 0.05 for dividend payout ratio that proves random effect model is better than pooled OLS model. Besides, prob>chi^2 of Hausman test is less than 0.05 for dividend payout ratio. Thus, it evidently suggests that fixed effects model is more appropriate over random effects models for this research. Overall, based on these two tests, fixed effects model is better than both pooled OLS and random effect model in this analysis.

Table 5.18: Model Diagnostics Test for Climate Change and Cost of Equity Model

Test	Value type	Value
Breusch and Pagan LM Test	Probability	0.0000
Hausman Test	Probability Chi^2	0.0016
Multicollinearity Test (VIF)	Mean	1.0900
Serial Correlation	Prob. Chi^2	0.1142
Heteroskedasticity Test	Prob. Chi^2	0.0000

Table 5.18 indicates that the outcome of Variance Inflation Factor (VIF), Wooldridge Test and Modified Wald Test. Firstly, the mean value of VIF in multicollinearity test is 1.09. This means there is no multicollinearity problem existed as the VFI mean value 1.09 is less than 10. Besides, serial correlation is analyzed by using Wooldridge Test in this study and the result shows that the prob>F of Wooldridge Test is 0.1142, which is more than 0.05. Therefore, the model is free from autocorrelation. Additionally, heteroscedasticity problem in fixed effects model is tested by Modified Wald Test, which shows the prob>chi^2 is 0.0000 and declared that heteroscedasticity problem in fixed effects model is existed as the prob>chi^2 is less than 0.05. Due to the heteroscedasticity problem, fixed effect with robust standard error is adopted to resolve the problems of heteroscedasticity.

5.4 Climate Change and Stock Market Investor's Behavior

5.4.1 Demographic Profile of Respondents

Among the 273 samples were used for the analysis, the male and female ratio was approximately similar with 52.7% male and 47.3% female (Table 5.19).

Approximately 90% respondents hold the tertiary and graduates' certificate, and the remaining holds certificate/diploma and secondary education. Most of the respondents (53.1%) considered their age 26-35 years old, only 8.8% were the young generation of age group 15-25 years old, and the remaining participants were above the age group of 36 years old. In term of share trading involvement, 45.8 % participants just started their business and considered having 0-5 years experience, followed by 22.3% who experienced 6-10 years, 9.2% found to be not interested to show their share involvement, and the outstanding were considered themselves more than 11 years of experience in the field. In considering the investment in share market, about 70% respondents have below RM5,000 followed by 12.8% who invested maximum of RM25,000. However, 3.3% and 14.7% participants have investment up to RM500,000 and up to RM100,000, respectively. 36.3% respondents declared that they have total income about RM5,000 and 31.5% says that their total income is about RM 10,000.

Table 5.19: Demographic Profile of the Stock Market Investor

Parameter	Criteria	No. of Participants	Percentage (%)
Gender	Male	144	52.7
	Female	129	47.3
Education Level	Secondary	16	5.9
	Certificate/Diploma	12	4.4
	Graduate &Tertiary	245	89.7
Age Group	15-25 Years	24	8.8
	26-35 Years	145	53.1
	36-45 Years	51	18.7
	46-55 Years	44	16.1
	56 and Above	9	3.3
Involved in Share Trading	0-5 Years	125	45.8
	6-10 Years	61	22.3
	11-15 Years	14	5.1
	16-20 Years	33	12.1
	21 Years and above	15	5.5
	Missing	25	9.2
Total Investment	Below RM5,000	189	69.2
	Below RM25,000	35	12.8
	Below RM100,000	40	14.7
	Below RM500,000	9	3.3
Stock Market Income	Below RM1,000	165	60.4
	Below RM5,000	88	32.2
	Below RM10,000	20	7.3
Total Income	Below RM1,000	15	5.5
	Below RM5,000	99	36.3
	Below RM10,000	86	31.5

	Below RM20,000	37	13.6
	Below RM50,000	22	8.1
	RM50,000 & More	14	5.1

5.4.2 Correlation Analysis

The correlation coefficient (r) values presented in the Table 5.20 displays the strength of the relationship among variables. Joseph (2010) suggested that the correlation value of 0 proves no relationship, while the correlation ±1.0 indicates perfect relationship. Cohen (1988) on the other hand, interpreted the correlation within 0 and 1.0 which are as follows; the correlation (r) between ±0.1 and ±0.29 indicate little relationship, then between ±0.30 and ±0.49 indicate an average relationship and more than ±0.50 displays strong/solid relationship. Generally, the findings reveal that all correlation is less than 0.70. This is in consistent with the revelation of Hair, Black, Babin, Anderson, and Tatham (2010) that correlation matrix ought not to exceed 0.70 to guarantee that the multicollinearity problem is not in existence in this study.

Table 5.20: Pearson Correlation for Stock Market Investor's Behavior

	Awareness	Product level	Business level	Stock Market level	Investment decision	Mean	Std. Deviation
Awareness	1					4.0205	.67684
Production level	.310**	1				3.4440	.65874
Business level	.243**	.205**	1			4.1377	.80115
Stock Market level	.235**	.135**	.216**	1		3.7524	.84153
Invest decision	.357**	.548**	.397**	.276**	1	3.1766	.74481

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

The above Table 5.20 discloses the Pearson correlation matrix among the variables. The highest level of correlation is found between investment decision and awareness with 35.7%, followed by production plan and awareness with 31.0%.

5.4.3 Assessment of Structural Equation Model

To perform the structural modeling, botstraping with 5,000 sample for actual 273 sample size was performed (Ringle, Wende, & Becker, 2015). The results show that company's total action include company initiative for climate change adjustment in production level, company initiative for climate change adjustment in business level, and company initiative for climate change adjustment in stock market level has significant positive influence on investment decision (path coefficient 0.480 and $p<0.001$). In addition to that investor's awareness about climate change has significant positive moderation between the company total initiative for climate change adjustment and investor's decision (path coefficient 0.201 and $p<0.001$). The path diagram of the structural model are given in Figure 5.1 and Table 5.21 shows the actual value of the direct hypotheses.

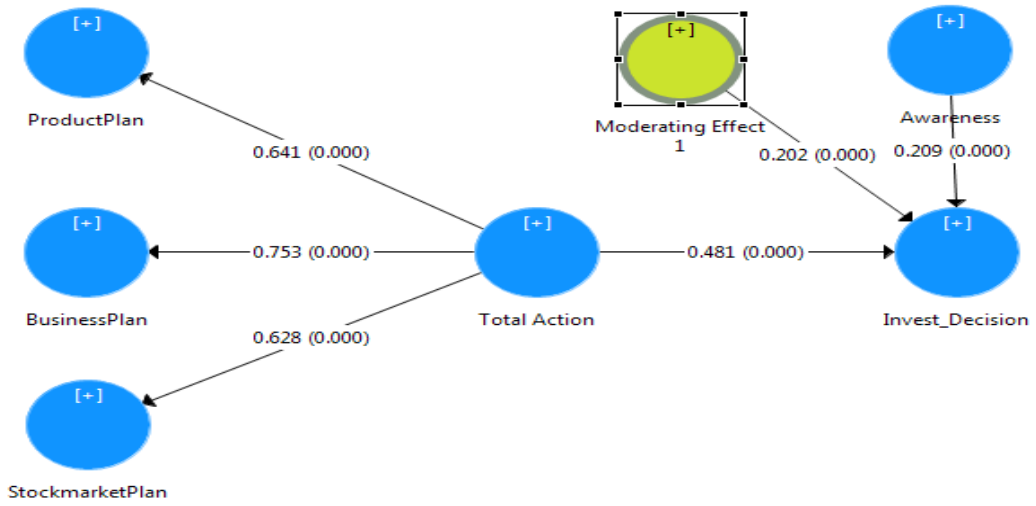

Figure 5.1: Path Co-efficient & P-Value in Structural Equation Model

Table 5.21: Structural Equation Model for Climate Change and Stock Market Investor's Behavior

Path	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Climate change awareness Moderating Effect -> Investment Decision	0.201	0.204	0.034	5.947	0.000
Company Total Action -> Investment Decision	0.480	0.480	0.051	9.442	0.000
Total Action -> Adjustment in Business level	0.753	0.754	0.038	19.613	0.000
Total Action -> Adjustment in Product level	0.641	0.637	0.075	8.536	0.000
Total Action -> Adjustment in Stock market level	0.628	0.624	0.078	8.090	0.000

5.4.4 Model Diagnostic Tests

To check the convergent validity and reliability, PLS-SEM observes the factor loading, average variance extracted, Cronbach alpha, and discriminant validity (Henseler, Hubona, & Ray, 2017). Table 5.22 displays the factor loading (lowest 0.494 and highest 0.980), average variance extracted (lowest 0.503 and maximum 0.783), Cronbach alpha for all variable above 0.83. According to the Henseler, Hubona, and Ray (2017), all the criteria meet the suggested value to measure the convergent validity.

Table 5.22: Construct Reliability and Validity for Stock Market Investor's Behavior Model

Variables	Item	Outer Loading	Cronbach alpha	Average Variance Extracted (AVE)
Awareness	Aware1	0.615	0.864	0.565

	Aware2	0.494		
	Aware3	0.774		
	Aware4	0.812		
	Aware5	0.971		
Product Plan	InitiaPL1	0.797	0.903	0.647
	InitiaPL2	0.834		
	InitiaPL3	0.887		
	InitiaPL4	0.728		
	InitiaPL5	0.767		
Business Plan	InitiaBL1	0.829	0.948	0.783
	InitiaBL2	0.931		
	InitiaBL3	0.825		
	InitiaBL4	0.849		
	InitiaBL5	0.980		
Stock Market Plan	InitiaSM1	0.933	0.933	0.731
	InitiaSM2	0.876		
	InitiaSM3	0.880		
	InitiaSM4	0.787		
	InitiaSM5	0.790		
Investment Decision	IDEC1	0.829	0.835	0.505
	IDEC2	0.633		
	IDEC3	0.699		
	IDEC4	0.636		
	IDEC5	0.737		

Further, it checked the discriminant validity by Fornell-Larcker Criterion and Heterotrait-Monotrait Ratio (HTMT). Table 5.23 displays Fornell and Larcker criteria where the correlation between the variable is not exceeded the square root of AVE (Ramli, Latan, & Natea, 2018).

Table 5.23: Diagnostic Test for Stock Market Investor's Behavior Model

Test	Variables	Awareness	Invest Decision	Product Plan	Business Plan	Stock Market Plan
FL Criterion	Awareness	0.751				
	Invest Decision	0.443	0.711			
	Product Plan	0.376	0.632	0.804		
	Business Plan	0.271	0.443	0.222	0.885	
	Stock Market Plan	0.261	0.314	0.142	0.235	0.855
HTMT	Awareness					
	Invest Decision	0.427				
	Product Plan	0.361	0.627			
	Business Plan	0.271	0.44	0.22		
	Stock Market Plan	0.264	0.313	0.144	0.232	

Additionally, Table 5.23 demonstrates that no variable has relationship with other variables more than 0.85. It suggested that all the variables are different and ensured the discriminant validity (Henseler, Hubona, & Ray, 2017; Ramli, Latan, & Natea, 2018). Therefore, convergent validity and reliability of the study variable allows to proceed for structural equation modelling.

6. CONCLUSIONS AND POLICY RECOMMENDATIONS

This chapter provides conclusion and recommendations on the overall study. In addition, this chapter includes the significance, limitations and further scopes of researches.

6.1 Conclusions

The overall purpose of this study is to examine the adaptation cost of climate change, especially in case of the El Nino and flood, for stock market performance of public listed agro and plantation companies in Malaysia. To fulfill this overall objective, this study investigated four specific objectives.

The first objective of this study is to investigate the impact of climatic change on stock market price volatility (market risk) of Malaysian agro and plantation companies. The findings show that dividend payout ratio and dividend yield are significantly and negatively associated with share price volatility. Companies that are categorized as profitable, fewer risks and stable normally payout higher dividends and fewer risks is defined as less volatile in share price. The outcome also agrees with dividend irrelevance theory whereby there is no impact on share price even though there is an increase in dividend payment and dividend yield. It shows that Malaysian plantation companies that pay higher dividends and dividend yields do not affect the volatility of share price. Furthermore, earnings volatility has a significant positive relationship with share price volatility compared to other control variables. It means an increase in earnings volatility leads to an increase in share price volatility. Thus, plantation companies in Malaysia have more stable movement of share price and can lead to higher dividend distributions. Then, the market value (size) of the company is significantly and negatively related with share price volatility. It depicts that big companies tend to have a sturdy position in the market that leads to less volatility in their share price. Therefore, Malaysian plantation companies tend to influence its share price less riskily. Next, long-term debt affects the share price volatility significantly and negatively. It shows that companies financed by debt influence its share price volatility moderately. Long-term debt is a source of fund that leverages with the investors' funds to allow the return to the equity investors. In conclusion, Malaysian plantation companies financed by debt moderately affect the movement of their share price. Besides, growth in assets has an insignificant negative relationship with share price volatility and it depicts that growth in assets do not influence share price volatility.

Nevertheless, El Nino serves as a dummy variable in this study. El Nino has an insignificant positive relationship with share price volatility. It reveals that an increase in El Nino leads to an increase in share price volatility in Malaysian plantation companies, but not statistically significant. El Nino causes the disruption in crops where it leads to reduction in company performance and eventually affects the share price volatility of plantation companies in Malaysia. Similarly, flood serves as a dummy variable in this study. Flood also has an insignificant positive relationship with share price volatility. It reveals that an increase in flood will lead to an increase in share price volatility in Malaysian plantation companies, but not statistically significant. Flood is a climatic event whereby the overflow of water that submerges the dry land tends to disrupt the crops. Company performance will be affected once

the crops are destroyed and affect the share price volatility of Malaysian plantation companies.

The second objective of this study aims to find out the equity market risk premium (market return) of agro and plantation companies in Bursa Malaysia for climate change events. At the beginning of this investigation, the hypothesis was constructed with the idea of El Nino event; the global heat waves might influence the investor's perceptions about plantation stock output, and classified it as a riskier investment to invest to the agriculture stocks during adverse weather conditions. Stock market is one of the methods to reflect investor's confidence in the stock, as well as observe if firms has to spend more funds on the climate finance to maintain their stock performance during El Nino event. From this study, it is interesting to find that the volatility risk of stock remains and didn't acted up as it assumed, however the result of return and risk premium of the stocks shown an unexpected result which could be quite distinctive behavior in the time of El Nino and Non El Nino period. El Nino is a long term phenomenon that last for few months. Therefore, it is difficult to measure the impacts in stock market because there are many other factors which might impact on the stock performance too. El Nino didn't make up to headline of the news on the exact day it happens, because the El Nino Index is calculated based on a 30days average. Lagged effect of the news could be something not quantitatively defined yet in this area of studies. News is unsystematic and covers wide range of information and might impact stock investors from a different way. NINDSOI Average Index data is not available in Malaysia, but from Australia BoM, and the charts and finding of the El Nino events are defined in different stages, which every country might have a different approach in reading the Index. Moreover, daily data is not open to public, but only monthly data is available to the public, which could be a main reason why stock volatility is not much affected in the period El Nino happens.

The third objective of this study examines the impact of climate change, such as El Nino and flood, on the cost of equity (dividend) of Malaysian agro and plantation companies. The findings show that El Nino has a positive impact on dividend payout ratio. This shows how critical is the climate change on the agro firms' performance. The rest of random effects model and pooled OLS regression indicate that El Nino has positive linkage on dividend payout ratio of the agro firms respectively as well. In addition, the impact of flood disaster on dividend payout ratio is, however, insignificant positive for the entire models of this study. Moreover, the robust fixed effects model shows that firms' profitability has a negative and statistically insignificant impact on dividend payout ratio. Besides, financial leverage of a firm also has a positive insignificantly association with dividend payout ratio. A positive but insignificant linkage is found between liquidity and dividend payout ratio respectively. Another interesting result is the positive impact of firm size on dividend payout ratio dependent variables for the fixed effects model employed whereby it indicate the larger the firm, the higher the dividend payout. However, growth opportunity has a negative impact on dividend payout ratio for the agro firms under the entire models employed. From the outcome of the most appropriate models in this study - robust fixed effects model, the independent variables that have significant relationship with dividend payout ratio dependent variable are El Nino and firm size, whereas the independent variables that have insignificant association with dividend payout ratio are profitability, leverage, liquidity, growth opportunity and flood.

Finally, the fourth objective is to investigate the reflection of climate change, such as El Nino and flood, on the stock market investor's behavior related to agro and plantation companies in Malaysia. Based on the primary data, the findings show that company's total initiatives and expenditure for adjustment of climate change include initiative at production level, initiate at accounting or business level, and initiative at stock market level have significant positive influences on the stock market investors' behavior or decision to invest in agro and plantation companies. Moreover, stock market investor's awareness about climate change has significant positive moderating impact between firm's initiative and spending for adaptation to climate change and investor's behavior and decision for investment in agro and plantation company stock in Malaysia.

The overall findings show that climatic events are long term phenomenon which has not adequate and significant instant impact on the stock price or market return. However, climate change has impacts on the annual accounting return of the company which causes loss or low profit for the company, and investors are also aware about the impacts of climate change. Therefore, public listed companies compensate the investors through providing higher dividend and maintain stability in stock price. This extra dividend to the investors can be considered as the adaptation cost at stock market level of public listed agro and plantation companies in Malaysia.

6.2 Policy Recommendations

This study has recommendations for investors, managers, and policy makers. The findings will help potential investors to identify the adjustment of the climate change information in the stock market and also select climate change risk adjusted stocks from the plantation sector of Malaysia. Moreover, if investors are more aware about the climate change issues, it will give them better arbitrage return.

The management of agro and plantation companies should link dividend payment decision related to the climate change event in order to enhance the stock market value of the company and enhance the future firm performance. At the same time agro and plantation firms should focus on innovation and mitigation as well as diversify their business portfolio to reduce the long run business risk due to climate change. Furthermore, as the findings show firm size and long-term debt affect the share price volatility, management should use of optimal debt levels to increase firm size and it will also reduce the volatility of share price.

Finally, the findings will help the regulatory agency and policy maker to improve the market efficiency of Bursa Malaysia and to achieve the United Nations' targets of sustainable stock exchange initiatives in relation to climate change. In this regards, Securities and Exchange Commission (SEC) and other market monitoring agencies as well as broker houses should increase the accessibility of different types of climatic data to the investors and aware them about the potential impact of climate change on company performance and stock price.

6.3 Limitations and Scopes of Future Research

This study considered secondary data for 33 companies out of 42 public listed Plantation companies in Bursa Malaysia Main market over the period of 2003 to 2016.

Moreover, it used event study based on las ten years' data, and the useful survey sample was considered for only 273 samples. Therefore, there is scope to check the findings from other related markets, like ACE Market of Bursa Malaysia, or other countries like South-East Asian region with large dataset.

Similarly, this study considered only El Nino and flood for climate change variables and there is scope to check the result by using other climate change variables. Finally, this is a pioneer study on this issue. More studies are also needed in terms of different samples, variables, methods, to test the validity of the findings.

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APPENDICES

Appendix I: Parameters for Measuring Climate Change and Stock Market Investor's Behavior

Variables/ Construct	Parameters/ Items	Number of Respondents					(1&2)	(4&5)	Mean Score
		1	2	3	4	5	(%)	(%)	
Investor's Awareness about Climate Change	B-1 Climate change like heavy rainfall, high temperature, cyclone, El Nino, flood, has overall negative impacts on Malaysian agriculture and plantation sectors	4	19	57	95	98	8.4	70.7	3.97
	B-2 Climate change causes to increase production cost in Malaysian agriculture and plantation sectors	4	11	45	131	82	5.5	78	4.01
	B-3 Climate change causes to decrease productivity of crops in Malaysian agriculture and plantation sectors	0	11	41	147	74	4	81	4.04
	B-4 Climate change causes to decrease total profitability in Malaysian agriculture and plantation sectors	2	6	50	136	79	2.9	78.7	4.04
	B-5 Climate change causes to increase the vulnerability of the overall agriculture and plantation sectors in Malaysia	0	9	55	124	85	3.3	76.5	4.044
Reflection of Climate Change in Investment Decision	B-6 As a shareholder and investor in stock market, I am concerned about the impact of climatic change on the financial performance of agriculture and plantation companies	1	44	117	76	35	16.5	40.6	3.37
	B-7 When buy or sell agriculture and plantation company share, I consider the issue of climate change	12	46	134	53	28	21.2	29.7	3.14
	B-8 Climate change risk causes to increase the volatility of share price of agriculture and plantation companies	7	40	152	48	26	17.2	27.1	3.17
	B-9 As a shareholder, I expect to get extra risk premium for investing in agriculture and plantation company due to climate change risk	9	27	129	70	38	13.2	39.5	3.37
	B-10 As a shareholder, I expect to get extra dividend for investing in agriculture and plantation company due to climate change risk	36	59	110	50	18	34.8	24.9	2.84
Company's Initiative about Climate Change in Production Level	B-11 Malaysian agriculture and plantation companies change the production methods like crop rotation, timing, using new technologies, to adapt to climate change	0	9	146	95	23	3.3	45.2	3.48
	B-12 Malaysian agriculture and plantation companies improve infrastructure like crop storage system, irrigation system, to adapt to climate change	1	30	116	100	26	11.4	46.1	3.44

	B-13 Malaysian agriculture and plantation companies involve stakeholders at all level to adapt to climate change	0	30	130	89	24	11	41.4	3.39
	B-14 Malaysian agriculture and plantation companies invest handsome amount in R&D to adapt to climate change	5	30	114	96	28	12.8	45.5	3.41
	B-15 Malaysian agriculture and plantation companies looking for financial supports & subsidies from different stakeholders and agencies to adapt to climate change	0	9	142	100	22	3.3	44.7	3.49
Company's Initiative about Climate Change in Business level	B-16 Malaysian agriculture and plantation companies make changes in the accounting system like maintain reserve fund, allocate a climate budget, to adapt to climate change	1	4	59	98	111	1.8	76.6	4.15
	B-17 Malaysian agriculture and plantation companies take enough initiative to reduce the risk, like extensive insurance coverage, hire expert, to adapt to climate change	1	11	57	81	123	4.4	84.8	4.15
	B-18 Malaysian agriculture and plantation companies adjust the climatic issues in the financial dealings and reporting system to adapt to climate change	0	5	82	68	118	1.8	68.1	4.1
	B-19 Malaysian agriculture and plantation companies diversify asset portfolio including non-agricultural business wings to adapt to climate change risk	0	4	52	99	118	1.5	79.5	4.21
	B-20 Malaysian agriculture and plantation companies find alternative source of capital to reduce cost of capital due to climate change risk	0	22	50	85	116	8.1	73.6	4.08
Company's Initiative about Climate Change in Stock Market	B-21 Malaysian agriculture and plantation companies are concerned about shareholders expectation regarding climate change risk	6	17	79	111	60	8.4	62.7	3.74
	B-22 Malaysian agriculture and plantation companies take enough initiative to adjust climate risk in stock market	0	26	79	103	65	9.5	61.5	3.76
	B-23 Malaysian agriculture and plantation companies take proper initiative to reduce climate change induced stock price volatility	0	18	87	105	63	6.6	61.6	3.78
	B-24 Malaysian agriculture and plantation companies properly communicate with investors and shareholders regarding climate change news	5	15	76	106	71	7.3	64.8	3.82
	B-25 Malaysian agriculture and plantation companies provide extra dividend to keep holding investors in spite of climate change risk	10	28	67	106	62	13.9	61.5	3.67

Appendix II: Correlation between KLCI Index and Individual stock returns

	COMPANY	Measurement	KLCI RETURN								
			TOTAL PERIOD			EL NINO			Non EL NINO		
			10Y	5Y	1Y	10Y	5Y	1Y	10Y	5Y	1Y
1	AAB Return	Pearson	.091**	.064*	.170*	.090*	0.0780	.a	.092**	0.0593	.171*
		Sig. (2-tailed)	.000	.025	.018	.047	.148		.000	.077	.018
		N	2541	1238	195	485	345	4	2056	893	191
2	BLDP return	Pearson	.164**	0.009	(0.046)	0.052	0.040	.a	.187**	(0.010)	(0.047)
		Sig. (2-tailed)	.000	.761	.522	.255	.464		.000	.763	.520
		N	2541	1238	195	485	345	4	2056	893	191
3	CWG return	Pearson	.308**	.176**	.313**	.193**	.140**	0.6936	.337**	.198**	.310**
		Sig. (2-tailed)	.000	.000	.000	.000	.009	.306	.000	.000	.000
		N	2541	1238	195	485	345	4	2056	893	191
4	FEH return	Pearson	.047*	-0.039	-0.107	-0.027	-0.031	.a	.062**	-0.046	-0.107
		Sig. (2-tailed)	.018	.166	.137	.560	.571		.005	.171	.142
		N	2541	1238	195	485	345	4	2056	893	191
5	GENP return	Pearson	.376**	.317**	.298**	.362**	.351**	-0.1829	.380**	.293**	.303**
		Sig. (2-tailed)	.000	.000	.000	.000	.000	.817	.000	.000	.000
		N	2541	1238	195	485	345	4	2056	893	191
6	GLBH return	Pearson	.173**	.088**	0.0530	.207**	.186**	-0.1137	.165**	0.042597	0.0524
		Sig. (2-tailed)	.000	.002	.462	.000	.001	.886	.000	.203	.471
		N	2541	1238	195	485	345	4	2056	893	191
7	GOP return	Pearson	.092**	0.0480	0.0337	0.057384	0.0194	.a	.105**	.074*	0.0338
		Sig. (2-tailed)	.000	.091	.640	.207	.720		.000	.027	.643
		N	2541	1238	195	485	345	4	2056	893	191
8	HAPL return	Pearson	.216**	.155**	.168*	.177**	.159**	0.7138	.225**	.152**	.168*
		Sig. (2-tailed)	.000	.000	.019	.000	.003	.286	.000	.000	.020
		N	2541	1238	195	485	345	4	2056	893	191
9	HARN return	Correlation	.141**	.059*	0.0313	0.0535	0.0444	.a	.160**	.068*	0.0314
		Sig. (2-tailed)	.000	.037	.664	.239	.411		.000	.041	.666
		N	2541	1238	195	485	345	4	2056	893	191
10	IJMP return	Pearson	.225**	.132**	.200**	.148**	.143**	-0.8977	.247**	.130**	.204**
		Sig. (2-tailed)	.000	.000	.005	.001	.008	.102	.000	.000	.005
		N	2541	1238	195	485	345	4	2056	893	191
11	IKEN return	Pearson	.252**	.130**	0.0674	.229**	.239**	0.4674	.260**	0.062399	0.0662
		Sig. (2-tailed)	.000	.000	.349	.000	.000	.533	.000	.062	.363
		N	2541	1238	195	485	345	4	2056	893	191

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

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

Appendix II: Continue…

	COMPANY	Measurement	KLCI RETURN								
			TOTAL PERIOD			EL NINO			Non EL NINO		
			10Y	5Y	1Y	10Y	5Y	1Y	10Y	5Y	1Y
12	INNO return	Pearson	.075**	.075**	.231**	(0.013)	(0.010)	(0.467)	.094**	.120**	.237**
		Sig. (2-tailed)	.000	.009	.001	.773	.856	.533	.000	.000	.001
		N	2541	1238	195	485	345	4	2056	893	191
13	IOI return	Pearson	.551**	.453**	.337**	.530**	.528**	0.619	.557**	.396**	.336**
		Sig. (2-tailed)	.000	.000	.000	.000	.000	.381	.000	.000	.000
		N	2541	1238	195	485	345	4	2056	893	191
14	JT return	Pearson	.247**	.278**	.315**	.306**	.296**	0.899	.230**	.265**	.310**
		Sig. (2-tailed)	.000	.000	.000	.000	.000	.101	.000	.000	.000
		N	2541	1238	195	485	345	4	2056	893	191
15	KHP return	Pearson	.209**	.190**	.241**	.170**	.161**	(0.815)	.220**	.210**	.247**
		Sig. (2-tailed)	.000	.000	.001	.000	.003	.185	.000	.000	.001
		N	2541	1238	195	485	345	4	2056	893	191
16	KIML return	Pearson	.286**	.196**	.250**	.214**	.228**	0.562	.306**	.179**	.251**
		Sig. (2-tailed)	.000	.000	.000	.000	.000	.438	.000	.000	.000
		N	2541	1238	195	485	345	4	2056	893	191
17	KLK return	Pearson	.394**	.375**	.253**	.400**	.406**	(0.080)	.394**	.353**	.256**
		Sig. (2-tailed)	.000	.000	.000	.000	.000	.920	.000	.000	.000
		N	2541	1238	195	485	345	4	2056	893	191
18	KLR return	Pearson	.092**	.082**	0.098	0.055	0.071	.a	.101**	.091**	0.098
		Sig. (2-tailed)	.000	.004	.174	.225	.186		.000	.006	.176
		N	2541	1238	195	485	345	4	2056	893	191
19	KWAN return	Pearson	.161**	0.049	0.026	.103*	0.068	0.898	.174**	0.042	0.019
		Sig. (2-tailed)	.000	.083	.721	.023	.209	.102	.000	.212	.789
		N	2541	1238	195	485	345	4	2056	893	191
20	MHC return	Correlation	.249**	.140**	.185**	.159**	.124*	-.975*	.272**	.150**	.191**
		Sig. (2-tailed)	.000	.000	.010	.000	.021	.025	.000	.000	.008
		N	2541	1238	195	485	345	4	2056	893	191
21	MPI return	Pearson	.224**	.206**	0.132	.232**	.205**	0.374	.221**	.208**	0.130
		Sig. (2-tailed)	.000	.000	.066	.000	.000	.626	.000	.000	.073
		N	2541	1238	195	485	345	4	2056	893	191
22	NPC return	Pearson	.075**	.064*	0.033	0.076	.115*	(0.114)	.077**	0.045	0.030
		Sig. (2-tailed)	.000	.025	.648	.093	.033	.886	.001	.179	.676
		N	2541	1238	195	485	345	4	2056	893	191
23	NSOP return	Pearson	.121**	0.013	0.021	0.066	0.012	(0.898)	.135**	0.013	0.024
		Sig. (2-tailed)	.000	.646	.766	.148	.830	.102	.000	.701	.742
		N	2541	1238	195	485	345	4	2056	893	191
24	PLS return	Pearson	.112**	(0.003)	(0.040)	0.011	(0.008)	(0.457)	.136**	0.000	(0.031)
		Sig. (2-tailed)	.000	.914	.577	.809	.875	.543	.000	.993	.675
		N	2541	1238	195	485	345	4	2056	893	191

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

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

Appendix II: Continue…

	COMPANY	Measurement	KLCI RETURN								
			TOTAL PERIOD			EL NINO			Non EL NINO		
			10Y	5Y	1Y	10Y	5Y	1Y	10Y	5Y	1Y
25	PPB return	Pearson	.097**	.069*	0.059	.154**	.139**	0.659	.087**	0.054	0.056
		Sig. (2-tailed)	.000	.015	.411	.001	.010	.341	.000	.110	.444
		N	2541	1238	195	485	345	4	2056	893	191
26	RRE return	Pearson	.164**	.127**	0.103	.170**	.185**	0.754	.163**	.090**	0.095
		Sig. (2-tailed)	.000	.000	.151	.000	.001	.246	.000	.007	.189
		N	2541	1238	195	485	345	4	2056	893	191
27	RSAW return	Pearson	.333**	.248**	.291**	.233**	.245**	0.635	.358**	.253**	.287**
		Sig. (2-tailed)	.000	.000	.000	.000	.000	.365	.000	.000	.000
		N	2541	1238	195	485	345	4	2056	893	191
28	SBR return	Pearson	.181**	.128**	0.096	.155**	.185**	(0.257)	.188**	.110**	0.100
		Sig. (2-tailed)	.000	.000	.182	.001	.001	.743	.000	.001	.168
		N	2541	1238	195	485	345	4	2056	893	191
29	SHL return	Pearson	.079**	.087**	0.069	.105*	0.090	0.898	.071**	.086*	0.062
		Sig. (2-tailed)	.000	.002	.336	.020	.096	.102	.001	.010	.395
		N	2541	1238	195	485	345	4	2056	893	191
30	SIME return	Pearson	.525**	.515**	.477**	.629**	.649**	0.193	.492**	.432**	.479**
		Sig. (2-tailed)	.000	.000	.000	.000	.000	.807	.000	.000	.000
		N	2541	1238	195	485	345	4	2056	893	191
31	SOP return	Pearson	.226**	.126**	.314**	.096*	0.097	(0.247)	.263**	.147**	.319**
		Sig. (2-tailed)	.000	.000	.000	.034	.073	.753	.000	.000	.000
		N	2541	1238	195	485	345	4	2056	893	191
32	SPLB return	Pearson	.196**	.141**	0.127	.231**	.200**	0.467	.185**	.103**	0.120
		Sig. (2-tailed)	.000	.000	.077	.000	.000	.533	.000	.002	.097
		N	2541	1238	195	485	345	4	2056	893	191
33	TDM return	Correlation	.282**	.297**	.249**	.371**	.410**	(0.316)	.264**	.244**	.255**
		Sig. (2-tailed)	.000	.000	.000	.000	.000	.684	.000	.000	.000
		N	2541	1238	195	485	345	4	2056	893	191
34	THP return	Pearson	.249**	.230**	.289**	.241**	.240**	0.694	.250**	.226**	.291**
		Sig. (2-tailed)	.000	.000	.000	.000	.000	.306	.000	.000	.000
		N	2541	1238	195	485	345	4	2056	893	191
35	TSH return	Pearson	.297**	.204**	.165*	.257**	.273**	0.691	.308**	.162**	.160*
		Sig. (2-tailed)	.000	.000	.021	.000	.000	.309	.000	.000	.027
		N	2541	1238	195	485	345	4	2056	893	191
36	UMR return	Pearson	.246**	.154**	0.056	.200**	.200**	0.794	.258**	.130**	0.050
		Sig. (2-tailed)	.000	.000	.435	.000	.000	.206	.000	.000	.490
		N	2541	1238	195	485	345	4	2056	893	191
37	UPL return	Pearson	.105**	.071*	.166*	0.065	0.033	(0.870)	.115**	.092**	.168*
		Sig. (2-tailed)	.000	.013	.021	.153	.545	.130	.000	.006	.020
		N	2541	1238	195	485	345	4	2056	893	191

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

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

Appendix III: Calculated BETA for Three Time period and Three Series of data

	Beta for 10 Years data			
	Company	Total Period	El Nino	Non El Nino
	KLPLN	0.86640	0.77378	0.89293
1	AAB	0.42652	0.35632	0.44586
2	BLDP	0.34632	0.07329	0.42425
3	CWG	0.90874	0.51182	1.02167
4	FEH	0.10848	-0.04842	0.15269
5	GENP	0.82221	0.77990	0.83401
6	GLBH	0.69390	0.79619	0.66725
7	GOP	0.37402	0.25888	0.41158
8	HAPL	0.56217	0.38717	0.61088
9	HARN	0.56541	0.15563	0.68096
10	IJMP	0.56320	0.35421	0.62585
11	IKEN	1.01149	0.95668	1.02761
12	INNO	0.46644	-0.06318	0.61515
13	IOI	1.19965	1.15849	1.21129
14	JT	0.88911	1.10882	0.82644
15	KHP	0.75401	0.58031	0.80463
16	KIML	0.63521	0.46961	0.68308
17	KLK	0.85253	0.76780	0.87686
18	KLR	0.29528	0.13927	0.33833
19	KWAN	0.48886	0.25059	0.55574
20	MHC	0.79174	0.46152	0.88572
21	MPI	0.72909	0.70963	0.73327
22	NPC	0.23183	0.14766	0.25544
23	NSOP	0.24012	0.12112	0.27334
24	PLS	0.48326	0.04288	0.60631
25	PPB	0.98278	1.07155	0.95152
26	RRE	0.40250	0.35206	0.41600
27	RSAW	1.11621	0.69210	1.23671
28	SBR	0.51156	0.33167	0.56273
29	SHL	0.55102	0.72627	0.50008
30	SIME	1.05863	1.39302	0.96257
31	SOP	0.59767	0.26171	0.69208
32	SPLB	0.51476	0.58378	0.49280
33	TDM	1.07570	1.15231	1.05383
34	THP	0.65208	0.58416	0.66929
35	TSH	0.85099	0.69780	0.89322
36	UMR	0.34293	0.25085	0.36928
37	UPL	0.20205	0.10592	0.22956

Beta for 5 Years data				
	Company	Total Period	El Nino	Non El Nino
	KLPLN	0.68005	0.76977	0.61676
	AAB	0.31694	0.28751	0.33911
	BLDP	0.01326	0.05168	-0.01046
	CWG	0.52386	0.35414	0.64598
	FEH	-0.10358	-0.05175	-0.14354
	GENP	0.63994	0.71177	0.58901
	GLBH	0.44213	0.73459	0.24324
	GOP	0.19038	0.08188	0.27879
	HAPL	0.32057	0.34991	0.29868
	HARN	0.23300	0.12350	0.31255
	IJMP	0.35943	0.32764	0.38918
	IKEN	0.37994	0.64366	0.19245
	INNO	0.36596	-0.03929	0.65398
	IOI	0.98481	1.19123	0.83686
	JT	0.98116	1.08487	0.90698
	KHP	0.80214	0.56734	0.97735
	KIML	0.45576	0.46796	0.44609
	KLK	0.67160	0.78545	0.59176
	KLR	0.28149	0.13359	0.38461
	KWAN	0.14268	0.14568	0.13875
	MHC	0.47392	0.34124	0.56871
	MPI	0.76033	0.63555	0.84223
	NPC	0.16946	0.21032	0.14019
	NSOP	0.02754	0.02053	0.02974
	PLS	-0.00956	-0.03357	0.00467
	PPB	0.94160	0.96292	0.90897
	RRE	0.26492	0.35321	0.19740
	RSAW	0.77098	0.71355	0.81704
	SBR	0.33721	0.32590	0.34334
	SHL	0.52669	0.47493	0.56579
	SIME	1.28180	1.49090	1.12784
	SOP	0.34608	0.26653	0.40273
	SPLB	0.37507	0.48284	0.29161
	TDM	1.18566	1.32274	1.09027
	THP	0.65769	0.58608	0.70404
	TSH	0.54917	0.67045	0.46107
	UMR	0.21295	0.23639	0.19661
	UPL	0.14037	0.05206	0.20402

Beta for 1Year Data				
	Company	Total Period	El Nino	Non El Nino
	KLPLN	0.43337	0.52754	0.43248
	AAB	0.64301	0.00000	0.64785
	BLDP	-0.06440	0.00000	-0.06572
	CWG	0.67276	0.89094	0.66843
	FEH	-0.37234	0.00000	-0.37331
	GENP	0.41940	-0.19623	0.42655
	GLBH	0.16336	-0.11782	0.16174
	GOP	0.12400	0.00000	0.12461
	HAPL	0.33143	1.39907	0.32999
	HARN	0.15540	0.00000	0.15676
	IJMP	0.47729	-1.04206	0.48562
	IKEN	0.19567	0.32525	0.19283
	INNO	1.10458	-1.67630	1.13369
	IOI	0.46100	1.61931	0.45233
	JT	0.82065	2.43674	0.80543
	KHP	1.42799	-3.16318	1.46570
	KIML	0.49940	1.74844	0.49458
	KLK	0.21172	-0.06553	0.21346
	KLR	0.41483	0.00000	0.41894
	KWAN	0.05637	2.74465	0.04219
	MHC	0.69584	-3.58373	0.72309
	MPI	0.47190	1.26632	0.46484
	NPC	0.07309	-0.51585	0.06563
	NSOP	0.01935	-1.14674	0.02485
	PLS	-0.16991	-2.78926	-0.12658
	PPB	1.51877	14.99527	1.43240
	RRE	0.21313	4.87845	0.18673
	RSAW	0.94246	3.88052	0.91665
	SBR	0.29695	-0.43469	0.31054
	SHL	0.30711	12.68362	0.24632
	SIME	1.39050	0.47152	1.39545
	SOP	0.56137	-0.26271	0.57092
	SPLB	0.27120	1.40593	0.25462
	TDM	1.32481	-2.16520	1.35292
	THP	0.71764	2.11796	0.71617
	TSH	0.35410	1.04644	0.34478
	UMR	0.05594	0.30646	0.05001
	UPL	0.28638	-0.26743	0.29213

Appendix IV: Stock Market Investor's Behavior Survey Questionnaire

INVESTORS BEHAVIOR & PERCEPTION RELATED TO CLIMATE CHANGE LINKED COMPANIES IN BURSA MALAYSIA

Dear Participants: *This is to inform you that the motive of this survey is only the academic and research purpose which has no linkage with any business institution or external parties. The collected information will be kept confidentially.*

Please answer all questions: fill in the blank and tick in the appropriate.

Section-A: Investor's Profile
Please answer all questions: fill in the blank and tick in the appropriate.

A-1 Name: _____; Gender: ☐ Male ☐ Female
A-2 Age: _____Years
A-3 Education Level: ☐ No Schooling/illiterate ☐ Primary
☐ Secondary ☐ Certificate/ Diploma
☐ Graduate & Tertiary Other_____
A-4 Current Main Occupation: _____
A-5 Current Supplementary Occupation: _____
A-6 How long are you involved in Share trading: _____ Year
A-7 Do you select share or the fund / unit trust manager do that? ☐ Myself ☐ Manager
A-8 What is your total investment in stock market?
☐ Below RM5,000 ☐ Below RM25,000 ☐ Below RM50,000
☐ Below RM100,000 ☐ Below RM500,000 ☐ RM500,000 & more
A-9 What is your monthly income from stock market?
☐ Below RM1,000 ☐ Below RM5,000 ☐ Below RM10,000
☐ Below RM20,000 ☐ Below RM50,000 ☐ RM50,000 & more
A-10 What is your total monthly income?
☐ Below RM1,000 ☐ Below RM5,000 ☐ Below RM10,000
☐ Below RM20,000 ☐ Below RM50,000 ☐ RM50,000 & more

Section-B: Investor's Understanding & Expectation related to Climate Change Related Share
Give your opinion about following statements in 1-5 scales, where 1- strongly disagree, 2- disagree, 3- neutral, 4- agree, 5- strongly agree

Statements	1	2	3	4	5
Investor's Awareness about Climate Change					
B-1 Climate change like heavy rainfall, high temperature, cyclone, El-Nino, flood, has overall negative impacts on Malaysian agriculture and plantation sectors					
B-2 Climate change causes to increase production cost in Malaysian agriculture and plantation sectors					
B-3 Climate change causes to decrease productivity of crops in Malaysian agriculture and plantation sectors					
B-4 Climate change causes to decrease total profitability in Malaysian agriculture and plantation sectors					
B-5 Climate change causes to increase the vulnerability of the overall agriculture and plantation sectors in Malaysia					
Reflection of Climate Change in Investment Decision					
B-6 As a shareholder and investor in stock market, I am concerned about the impact of climatic change on the financial performance of agriculture and plantation companies					
B-7 When buy or sell agriculture and plantation company share, I consider the issue of climate change					

B-8 Climate change risk causes to increase the volatility of share price of agriculture and plantation companies					
B-9 As a shareholder, I expect to get extra risk premium for investing in agriculture and plantation company due to climate change risk					
B-10 As a shareholder, I expect to get extra dividend for investing in agriculture and plantation company due to climate change risk					
Company's Initiative about Climate Change in Production Level					
B-11 Malaysian agriculture and plantation companies change the production methods like crop rotation, timing, using new technologies, to adapt to climate change					
B-12 Malaysian agriculture and plantation companies improve infrastructure like crop storage system, irrigation system, to adapt to climate change					
B-13 Malaysian agriculture and plantation companies involve stakeholders at all level to adapt to climate change					
B-14 Malaysian agriculture and plantation companies invest handsome amount in R&D to adapt to climate change					
B-15 Malaysian agriculture and plantation companies looking for financial supports & subsidies from different stakeholders and agencies to adapt to climate change					
Company's Initiative about Climate Change in Business level					
B-16 Malaysian agriculture and plantation companies make changes in the accounting system like maintain reserve fund, allocate a climate budget, to adapt to climate change					
B-17 Malaysian agriculture and plantation companies take enough initiative to reduce the risk, like extensive insurance coverage, hire expert, to adapt to climate change					
B-18 Malaysian agriculture and plantation companies adjust the climatic issues in the financial dealings and reporting system to adapt to climate change					
B-19 Malaysian agriculture and plantation companies diversify asset portfolio including non-agricultural business wings to adapt to climate change risk					
B-20 Malaysian agriculture and plantation companies find alternative source of capital to reduce cost of capital due to climate change risk					
Company's Initiative about Climate Change in Stock Market					
B-21 Malaysian agriculture and plantation companies are concerned about shareholders expectation regarding climate change risk					
B-22 Malaysian agriculture and plantation companies take enough initiative to adjust climate risk in stock market					
B-23 Malaysian agriculture and plantation companies take proper initiative to reduce climate change induced stock price volatility					
B-24 Malaysian agriculture and plantation companies properly communicate with investors and shareholders regarding climate change news					
B-25 Malaysian agriculture and plantation companies provide extra dividend to keep holding investors in spite of climate change risk					