Climate Change Adaptation Cost in the Stock Market

Md. Mahmudul Alam
Associate Professor
School of Economics, Finance & Banking
Universiti Utara Malaysia
Sintok, Kedah, Malaysia
Email: rony000@gmail.com

BACKGROUND

The overall objective of this research 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/or extra cost of equity (dividend) bearing by Malaysian public listed agro and plantation companies. The research project was carried out under Adaptation Finance Fellowship Programme (AFFP) from September 2018 to February 2020 with the collaboration of Thailand Development Research Institute (TDRI), Frankfurt School - UNEP Collaborating Centre for Climate & Sustainable Energy Finance (FS-UNEP Centre), University Utara Malaysia (UUM), and International Development Research Centre (IDRC).

INTRODUCTION

Climate change is an important factor that directly affects in the agricultural sector. Therefore, to adapt with the climate change, agriculture and plantation firms need to take different types of initiatives and spend in many ways, which is considered as climate change adaptation cost. 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 listed company, it needs to bear adaptation cost in three stages. At the very basic level, firm need to spend money at physical level adaptation, such as changing production techniques and approaches, upgrading the stakeholders' knowledge (i. e. producers, labors, storage, packaging, etc.), infrastructural changes, innovation, etc. Then, firm need to spend money at accounting level, such as change or adjustment in the accounting

system, maintain extra reserve fund, pay more insurance premium, pay higher cost of borrowing, diversify asset portfolio, etc. Finally, since the goal of public listed company is to maximize shareholder wealth by increasing stock price or maintaining stability in stock price, firms needs to pay extra risk premium or pay extra cost of equity through providing more dividend for climate change risk.

In the stock market, investors expect risk premium in order to accept the higher fluctuation or volatility of the stock price, because it affects their returns (Harper, 2017). 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 are required (Murray, 2015; Bhadada, 2015). This extra risk premium and extra cost of equity, dividend, can be considered as the climate change adaptation cost at stock market level. By spending this cost, agro and plantation companies can maintain stock market performance.

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.

METHODOLOGY

To fulfill the first and third objectives, the firm level data were collected for 33 Malaysian public listed plantation companies with 462 observations from the period of 2003 to 2016. For the climatic variables, both models considered El Nino and Flood as dummy variables. Here the inferences were drawn based on panel regression models such as Pooled Ordinary Least Square (OLS) regression, Fixed Effect, Random Effect, and were used to draw inferences. Several diagnostic tests were considered to select the best models and determine the robustness of the models.

For the second objective, this study conducted event study based on El Nino events that happened in last ten years from 2009 to 2018. The firm level daily stock price data for 37

companies, market index data, plantation index data, and El Nino (NINDSOIA Index) data were analyzed to determine risk, return and risk premium for the El Nino events. The risk, return and risk premium for plantation companies with El Nino Period and Non-El Nino period were compared with the Beta analysis. Beta is a component used in Capital Asset Pricing Model (CAPM) to calculate the expected market return of a stock or portfolio. The return of the stock market was compared against the KLCI Index by calculating beta for 1 year, 5 year and 10 year period and for El Nino period, non El Nino period and total period.

To fulfill the fourth objectives, a structured questionnaire survey was conducted among the individual investors in Malaysian Stock Market, Bursa Malaysia. Before design the final questionnaire a pilot test was conducted to adjust the parameters. A total 25 items were measured based on five-point Likert-scale, where 5 indicated highest and 1 indicated lowest value. To draw inferences this study estimated partial least square structural equation modelling (PLS-SEM) with 5,000 bootstrapping based on finally useable 273 samples out of total 320 surveyed samples. The PLS-SEM followed two steps process, where initially evaluated the measurement model and then evaluate the path coefficient model. 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.

The firm level secondary data were collected from Bursa Malaysia, Bloomberg and Thomson Reuters DataStream; among the climate change variables, El Nino data were collected from Climate Prediction Center, USA, and flood collected from FloodList and Wikipedia. The primary survey data were collected from online questionnaire survey among the individual investors from Bursa Malaysia.

For the tools of analysis, this study relied on several softwares – Microsoft Excel, SPSS, EViews, STATA, and Smart-PLS.

RESULTS AND FINDINGS

The findings of the first objective show that dividend payout ratio, dividend yield, market value and long-term debt has negative and significant impact on stock price volatility. On the other hand, earnings volatility has positive and significant impacts on stock price volatility.

However, El Nino, flood and growth in assets are found to be insignificant to stock price volatility of Malaysian plantations companies.

The findings of the second objective show that the El Nino has some mixed impact on the risk, return, and risk premium level, but in majority of the cases El Nino is not reflected in the equity market risk premium (market return) for Malaysian plantation companies.

The findings of the third objective show that El Nino, firm size, liquidity and financial leverage are positively and significantly influenced dividend payout ratio, whereby profitability and growth opportunity are inversely related to dividend payout ratio, and flood has no significant impact on dividend payout ratio of Malaysian plantation companies.

Finally, the findings of the fourth objective show that the company's total initiatives including production level initiatives, business or accounting level initiatives, and stock market level initiatives have significant positive influence on investor's behavior and decision for investment in agro and plantation companies in Malaysia. Moreover, investor's awareness about climate change also has significantly positive moderation effect between firm's initiatives for adaptation to climate change and investor's decision for investment in agro and plantation companies in Malaysia.

CONCLUSIONS AND RECOMMENDATIONS

The overall findings of the study 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 that causes loss or low profit for 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 has significant implications for investors, managers and policy makers. The findings of the study will be highly beneficial for capital market investors of agro-based companies through develop understanding about the adjustment of the climatic information in the stock market, and the findings could assist them in exploring the

opportunities in arbitraging. At the same time, the management of plantation companies will get an idea about the dividend policy related to the climatic events and may consider the climate related index as one of the cost measurement method for equity. 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. Finally, the findings will help the regulatory agency and policy maker to improve the market efficiency 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.

REFERENCES

Alam, M.M., Siwar, C., & Al-Amin, A.Q. (2010). Climate Change Adaptation Policy Guidelines for Agricultural Sector in Malaysia, *Asian Journal of Environmental and Disaster Management*, Vol. 2(4): 463– 469.

Bhadada, G. (2015). What is the relationship between equity risk premium and stock prices? Retrieved from https://www.quora.com/What-is-the-relationship-between-equity-risk-premium-and-stock-prices (accessed on 11th March 2020).

Harper, D. (2017). The Equity-Risk Premium: More Risk for Higher Returns. Retrieved from https://www.investopedia.com/articles/04/012104.asp (accessed on 11th March 2020).

Murray, R. (2015). How Climate Change is Putting Your Investments at Risk. Retrieved from https://www.telegraph.co.uk/sponsored/finance/investments/climate-environment/11799182/how-climate-change-affects-investments.html (accessed on 11th March 2020).