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GLOBAL DETERMINANTS OF MALAYSIA GOVERNMENT BOND

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
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ABSTRACT

This study seeks to investigate the global determinants of Malaysia government bond yield using monthly data from 2008 to 2019. This study employs the Johansen cointegration test and Vector Error Correction Model (VECM) to test the existence of long-run and short-run equilibrium within Malaysia government bond yield using the VIX index as a proxy for investor sentiment, USDMYR representing Malaysia currency, oil price and gold price. The results of the study suggest that investor sentiment and gold price have significant relationships with the Malaysia government bond yield in the long run while oil price, currency, investor sentiment and gold price have a short-run relationship with Malaysia government bond. However, only VIX index and oil price granger casual Malaysia government bond yield in the short run. This research will help explain the domestic bond market yield movement using more frequent daily data point like VIX index, currency, oil price and gold price compared to macroeconomic data like GDP or other Malaysia's fiscal data which are only available on a monthly or quarterly basis. This research will also add to the literature study on the determinants of the Malaysia Government bond which allow regulators to design policies in improving the efficiency of the bond market in Malaysia.

Keywords: Bond Yield, VIX Index, VECM, Cointegration test



ABSTRAK

Kajian ini menyiasat penentu global hasil bon kerajaan Malaysia menggunakan data bulanan dari tahun 2008 hingga 2019. Kajian ini akan menggunakan indeks VIX sebagai proksi untuk sentimen pelabur, USDMYR yang mewakili mata wang Malaysia, harga minyak dan harga emas yang akan diuji menggunakan ujian kointegrasi Johansen dan Model Pembetulan Ralat Vektor (VECM) untuk menentukan hubungan jangka panjang dan jangka pendek. Hasil kajian menunjukkan bahawa sentimen pelabur dan harga emas mempunyai hubungan yang sangat signifikan dengan hasil bon kerajaan Malaysia dalam jangka panjang dan jangka pendek. Sementara itu, harga minyak dan mata wang mempunyai hubungan jangka pendek dengan bon kerajaan Malaysia sementara harga minyak meyebabkan granger kasual hasil bond kerajaan Malaysia. Penyelidikan ini akan membantu pelabur meramalkan pergerakan hasil bon domestik menggunakan data seperti VIX indeks, mata wang, harga minyak dan harga emas yang boleh didapati dengan lebih kerap. Kajian ini juga dapat menambah lagi kajian sedia ada untuk penentu hasil bon kerajaan Malaysia dan ini dapat membantu pegawai kerajaan merangka dasar baru yang lebih baik untuk memajukan pasaran bon di Malaysia.

Kata Kunci: Bon, VIX Indeks, VECM, Ujian Kointegrasi



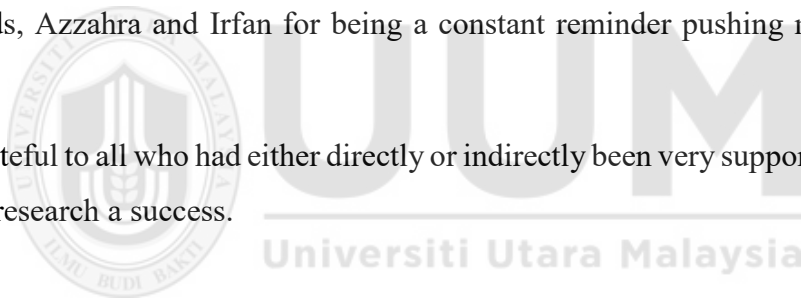
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TABLES OF CONTENTS

PERMISSION TO USE	i
ABSTRACT.....	ii
ABSTRAK.....	iii
ACKNOWLEDGEMENT.....	iv
TABLE OF CONTENTS.....	v
LIST OF TABLES.....	vii
LIST OF FIGURES.....	viii
LIST OF ABBREVIATIONS.....	ix

CHAPTER 1: INTRODUCTION

1.1 Background of Study.....	1
1.2 Problem Statement.....	2
1.3 Research Question.....	5
1.4 Research Objective.....	6
1.5 Significance of The Study.....	6
1.6 Scope and Limitation of The Study.....	6
1.7 Organization of Study.....	7

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction	8
2.2 Bond Definition.....	8
2.3 Government Bond Overview	9
2.4 Bond Yield Determinants.....	10
2.5 Relationship Between Investor Sentiment and Bond Yield.....	12
2.6 Relationship Between Currency and Bond Yield.....	14
2.7 Relationship Between Oil Price and Bond Yield.....	15
2.8 Relationship Between Gold Price and Bond Yield.....	16
2.9 Summary.....	17

CHAPTER 3: DATA & METHODOLOGY

3.1 Introduction.....	19
3.2 Research Framework.....	19
3.3 Data	21
3.4 Model.....	22

3.5 Unit Root Test.....	23
3.6 Cointegration Test.....	24
3.7 VECM.....	24
3.8 Granger Causality.....	26
3.9 Variance Decomposition.....	26
CHAPTER 4: RESULTS & DISCUSSIONS	
4.1 Introduction.....	27
4.2 Descriptive Analysis.....	27
4.3 Correlation Test.....	28
4.4 Unit Root Test.....	29
4.5 Cointegration Test.....	29
4.6 Vector Error Correction Model (VECM)	30
4.7 Granger Causality.....	32
4.8 Variance Decomposition.....	33
4.9 Diagnostic Test.....	35
4.10 Summary.....	36
CHAPTER 5: CONCLUSION & RECOMMENDATION	
5.1 Introduction.....	38
5.2 Summary of Findings.....	38
5.3 Contribution of The Study.....	39
5.4 Limitations of The Study and Future Research.....	40
REFERENCES.....	42

LIST OF TABLES

Table 2.1	Summary of Bond Yield Determinants	17
Table 3.1	Data Summary	21
Table 4.1	Descriptive Analysis	28
Table 4.2	Correlation Test	29
Table 4.3	Unit Root Test	29
Table 4.4	Optimal Lag Length Criteria	30
Table 4.5	Johansen Cointegration Test	30
Table 4.6	Vector Error Correction Model	31
Table 4.7	Pairwise Granger Causality Test	33
Table 4.8	Variance Decomposition Test	35
Table 4.9	Serial Correlation Test	35
Table 4.10	CUSUM Test	36



LIST OF FIGURES

Figure 3.1	Research Framework	21
Figure 4.1	Short-Run Relationship	32



LIST OF ABBREVIATIONS

BNM	Bank Negara Malaysia
MGS	Malaysia Government Bond
VECM	Vector Error Correction Model
GDP	Gross Domestic Product
GCC	Gulf Cooperation Council
GG	Government Guarantee
ADF	Augmented Dickey-Fuller
VAR	Vector Autoregression



CHAPTER 1

INTRODUCTION

1.1 Background of Study

Malaysia bond market has grown tremendously since its first introduction in the 1970s (Harun, 2002) following the establishment of the central bank of Malaysia, Bank Negara Malaysia (“BNM”). The first issuance of a government bond or Malaysia Government Securities (MGS) during that time was to support the country’s development agenda. The increasing demand from the private sector for a new form of financing continues to fuel the development of Malaysia’s corporate bond market. Growth has also been supported by the increasing presence of institutional investors, such as pension funds, unit trust funds and insurance companies. Since then, Malaysia outstanding bond and Sukuk markets have grown to RM 1.3 trillion in 2019 (Bixmalaysia, 2019) and are becoming the largest issuer of Sukuk in the world (Mosaid & Boutti, 2014).

While the local bond market continues to grow stronger, it attracts foreign investors to invest in the Malaysia bond market. In 2016, MGS recorded historically high ownership of foreign holdings at 51.32% as reported by Bank Negara Malaysia (BNM, 2017). Despite the high ownership which shows the attractiveness of the local capital market to the world, it does open Malaysia bond market to speculative trading (Abdullah & Razali, 2017). Even though the losses in other parts of the world may not impact Malaysia financial capabilities directly, it will sway the foreign investor ownership holding and make the bond market vulnerable to global volatility as foreign investors may change their investment direction to exit the Malaysia market and head to safe heaven market such as US treasury (Abdullah & Razali, 2017).

Awaludin & Masih’s (2015) study shows the existence of the relation of movement in the US treasury market to Malaysia government bond yield. These relationships may exist due to

investors acknowledging that the global market volatility will impact the local market, hence react to take the position. Awaludin & Masih's (2015) study supported the previous study by (BNM, 2013) which shows the movement of the domestic yield curve is increasingly influenced by movement in foreign bond yield as both domestic and foreign investors respond to global development and sentiments. Furthermore, a study by Choy et al. (2019) shows that currency and foreign interest rates have a significant impact on the Malaysia government bond. All these researches illustrate that as Malaysia bond market evolves to an open market, it will react to other global market variables even with no changes in its fundamentals and domestic economy. Hence, it is important to examine other global indicators that may have a relationship with Malaysia domestic bond market. This information will also provide investors with information to strategize their investment position and provide policy ramifications to the central authorities like the Securities Commission.

This study investigates the global determinants of Malaysia government bond yield using monthly data from January 2008 to July 2019. This study will be using the VIX index as a proxy for investor sentiment with USDMYR representing Malaysia currency, oil price and gold price which will then be tested using the Johansen cointegration test and Vector Error Correction Model (VECM) to determine the long-run and short-run relationship. This research will help investors explain the domestic bond market yield movement using straight forward data points like VIX index, currency, oil price and gold price.

1.2 Problem Statement

In the era of increasing global uncertainty such as former US President Trump's aggressive trade policy, China GDP normalization activity, Euro Quantitative easing, and Oil price volatility, the Malaysia bond market can be affected even though Malaysia's macroeconomic

data remain intact. Furthermore, most studies on determinants of the bond market have focused more on domestic macroeconomic variables (Choy et al., 2019) which is understandable due to the importance of these data to the sovereign default risk. However, studies focusing on the external variables determinants of the Bond market are still meager.

Furthermore, as Malaysia financial market continues to grow, its resonance to other financial markets will continue to be stronger which may expose Malaysia capital market vulnerability to adverse global economy scenarios even though its domestic fundamentals remain steady. Moreover, with many foreign investors holding to Malaysia government bond, any movement to the global market may impact the MGS yield movement which can culminate in an adverse systemic financial landscape (Abdullah & Razali, 2017).

This research, therefore, seeks to investigate the external global determinants of Malaysia government bond yield. The movement of the yield curve has been the subject of much interest in the finance literature because it is the natural starting point for pricing fixed-income securities and other financial assets. Wu (2003) has summarized that most literature generally agreed on the effects of macroeconomic variables, especially those of monetary policy such as inflation and interest rate, on the slope of the yield curve. However, Choy et al. (2019) found that despite the positive impact of domestic GDP growth on Malaysia government bond yield, the current account balance to GDP ratio shows insignificant results.

This research, hence, aims to contribute to the literature by incorporating the external global factors such as investors' sentiment, currency, oil price and gold price. The results from this research can shed some light on the investors' strategies for their investment planning as well as for policymakers to develop policies towards greater efficiency of the bond market in Malaysia.

This study will use the VIX Index, currency, oil price and gold price movement as variables and examine its relationship with Malaysia bond yield movement. There are many studies on the impact of the implied volatility index, like VIX, representing investors' sentiment to capital market movement such as (Chiang et al., 2015, Schwert, G. W., 2011, Becker et al., 2009). Despite the implied volatility index such as VIX derived from a basket of S&P 500 (SPX) stock index options, it does represent the investor sentiment to capital market especially for the advance market. This is as seen in Chiang et al. (2015) which is suitable to represent global investor sentiment in this study. Furthermore, as VIX index data are readily available, they have attracted some attention from the academic literature as they provide straight forward measures of market volatility (Feyen et al., 2015). The VIX index is very volatile and sensitive to global financial market disturbances such as the Asian currency crisis in 1997, the subprime crisis that surfaced in 2007 and US Quantitative Easing 2011 (Schwert, G. W., 2011). Thus, VIX should be able to represent the global market sentiment for this study.

Afonso et al.'s (2015) study demonstrated that currency is one of the drivers of local currency government bond yield movement. A depreciating local currency can be an early indicator of heightened fiscal stress and leads to an increase in credit risk. Furthermore, studies by (Muharam, 2013 and Choy et al., 2019) find a statistically significant relationship between Ringgit Malaysia currency with Malaysia Government Bond, MGS.

There is a lack of research regarding the impact of oil price movement on Malaysia bond yield. Based on the study in GCC countries (Woertz, E., 2008), Islamic corporate bond or Sukuk investors are very sensitive to changes in oil price. As GCC countries' economies are very reliant on oil income just like Malaysia, this study will contribute to the literature for oil price and bond yield in the Malaysia market.

There is only a few research found on the relationship between the gold price and bond yield. However, Baur & Lucey's (2010) study shows that gold is a good safe-haven asset during a financial crisis. Since the bond market is also found to be a good safe-haven asset during a financial crisis (Ciner et al., 2013), there is a positive relationship between the gold price and bond market in the US and UK market. The research further suggests the positive correlation between bond and gold exist may be due to the gold and bond market importance as a hedging mechanism. Furthermore, Ziaei et al.'s (2012) study found a significant impact of the gold price on Malaysia bond yield. This research hopes to contribute further to the studies of the gold price relationship and Malaysia bond yield.

1.3 Research Question

The study on the determinants of Malaysia bond yield has been done using mostly macroeconomic data such as interest rate and inflation (Choy et al., 2019). There are also further studies on the relationship of Malaysia bond yield with other advance markets such as the US treasury (Awaludin and Masih, 2015). Therefore, it is also interesting to widen the research to study the relationship of other global indicators such as the VIX Index, currency, oil price and gold price to the bond yield even though the indicator may not contribute directly to the domestic economy.

The research questions attempted to be answered through this study are:

- Is there a long-run relationship between investor sentiment as measured by VIX Index, currency, oil price and gold price to Malaysia's Government Bond yield?
- Is there a short-run relationship between investor sentiment as measured by VIX Index, currency, oil price and gold price to Malaysia's Government Bond yield?
- Is there a causal relationship between investor sentiment as measured by VIX Index, currency, oil price and gold price to Malaysia's Government Bond yield?

1.4 Research Objective

The objectives of this research are as follows:

- To investigate the long-run relationship between investor sentiment, currency, oil price and gold price to Malaysia's Government Bond yield
- To assess the short-run relationship between global volatility, currency, oil price and gold price to Malaysia's Government Bond yield
- To examine the causal relationship between global volatility, currency, oil price and gold price to Malaysia's Government Bond yield

1.5 Significance of the Study

This study will provide useful implication to the regulators, institutional investors, research analysts, and other investors when investing in the Malaysia bond market. In the era of increasing global uncertainty such as US President Trump's aggressive trade policy, China GDP normalization activity, Euro Quantitative easing, oil price volatility and many more, investors may end up with too many data points to be monitored. The results from this research can shed some light on the external determinants such as VIX index, currency, oil price and gold price on Malaysia bond yield via linear regression analysis. This research will also help investors to make strategic investment decisions in participating in the bond market.

1.6 Scope and Limitation of the Study

This study investigates the global determinants of Malaysia government bond yield using monthly data from 2008 to 2018. This study employs the VIX index as a proxy for global market volatility with USDMYR representing Malaysia currency, oil price and gold price which will then be tested using the Johansen cointegration test and Vector Error Correction Model (VECM) to determine the long-run relationship.

The limitation of this study is that it covers only Malaysia Government Securities (MGS) representing Malaysia Government bond. This excludes other types of Government bond such as Islamic Government bond (GII) and other government-guaranteed bonds.

1.7 Organization of study

This study is organized as follows. Chapter one deliberates on the background of the study and highlights the problem statement, research questions and research objective. Chapter two will present the theoretical underpinning of the previous studies and literature review. Chapter three discusses the research framework, data sources and the methodology. Chapter four presents the result of the analysis. Finally, chapter five concludes the findings and proposes future studies.



CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This section will highlight the related literature review. This chapter will start on the overview of government bond, followed by the theory of bond yield and research covering its determinants based on research done in Malaysia and other markets. This chapter will then examine the study done on the relationship between investor sentiment, currency, oil price and gold price to the bond market.

2.2 Bond Definition

A bond is a form of lending from a corporation or an issuer to raise money from the capital market. They are two ways of fundraising which is selling the company's shares for capital or lending from others. The lending method is then divided into direct lending from other organizations like banks or lending from investors through the capital market. Lending through the capital market is done through the issuance of bonds or Sukuk for its Islamic counterpart. In most countries, a mature and improved bond market is the basis of the national financial market (Savnder, 2012).

The bond market is an important part of the capital market. Malaysia bond market grows tremendously as it becomes the largest local currency bond market in ASEAN in 2015 (Choy et al., 2019) with the market growing from RM 0.42 trillion in 2010 to to RM1.3 trillion in 2019 (Bixmalaysia, 2019). Malaysia bond market has grown significantly from its infant stage after the 1997 Asian financial crisis where Malaysia's financial institutions find it is

challenging to supply financing for country development through lending and the government promotes the use of the capital market as the source of lending for corporations (Che-Yahya et al, 2016). In recent years, raising capital through issuing bonds or Sukuk have been the norm for corporations in Malaysia (Kim, 2009). Ahmad et al. (2009) assert that the strong development of corporate bonds in Malaysia is due to the flexible regulation by Securities Commission Malaysia in allowing corporations to issue Sukuk comparing to tight procedures imposed by financial institutions to provide loans especially if the amount is big with collateral imposed on the borrowers.

2.3 Government Bond Overview

Government bonds are not rated by the rating agency as their credit strengths are supported in full faith from the government where in the event of default, the bond will be paid by the government. Researches of the macroeconomic impacts on a domestic bond are normally conducted on government bonds due to its credit backing by the government which makes it the base for zero risk bond (Afonso et al, 2015, Hsing, 2015). The empirical studies on government bond can be divided into two categories which are single country-specific analysis or cross country analysis (Poghosyan, 2014). Single country-specific studies focus on matters that are important to the country itself while the cross-country study can provide results that are not limited by statistical interference due to the panel data method. However, single-country studies can have better control over corresponding variables and targeted periods compared to cross country study (Poghosyan, 2014).

This research will use Malaysia Government Bond called Malaysian Government Securities (MGS) which are debt instruments issued by Bank Negara Malaysia (BNM), the Central Bank of Malaysia, on behalf of the Government of Malaysia. These bonds are guaranteed by the

Malaysian government and therefore, considered to be default-free and risk-free. MGS is issued to meet long-term domestic borrowings demand, particularly to finance public sector projects to meet the country's development agenda. Another form of a government bond is a government-guaranteed bond (GG) which is issued by corporations, but its issuance is guaranteed by the Malaysia government. There is also a quasi-government bond that is issued by government-linked companies but its issuance is not guaranteed by the government.

2.4 Bond Yield Determinants

Bond yield is the return an investor realizes on a bond. When the bond bought at issuance, the bond yield would be the same as the coupon. The current yield is a function of the bond's price and its coupon or interest payment. There have been studies on bond yield determinants and the agreed consensus of bond yield determinants have been on the domestic impact such as default risk, private sector saving, prospects for economic growth, interest rate and inflation (Patje, 2014). However, there are increasing studies shows the bond yield movement impacted by nondomestic variables due to global market integration which led to some disconnections between the yield movement and fundamentals (Spyros, 2013, Poghosyan, 2014, Chernov et al., 2019).

Barrios et al.'s (2009) studies on the determinants of euro government bond during the 2008 financial crisis found that international investor sentiment plays a major role in explaining governments bond yields differentials. The studies further found that domestic factors such as liquidity and sovereign risk appear to be smaller but non-negligible drivers of yield spreads which point to significant interaction of general risk aversion and macroeconomic fundamentals. This shows the importance of international investor sentiment indicator like the VIX index to anticipate domestic government bond yield movement.

Other drivers of government bond yield are credit and currency (Afonso et al, 2015). A changing likelihood of government default is likely to affect the exchange rate. Currency weakening can be an early indicator of the fiscal stress which could also lead to higher credit risk. Meanwhile, Hsing (2015) concludes that movements in the dollar exchange rate of the emerging market affect local government bond yields through changes in the sovereign credit risk. The studies reveal that time-series variation in credit and currency risks is primarily affected by local variables. The credit risk premium is mostly affected by the credit factor. The currency risk premium, meanwhile, is affected by the credit factor as well as by the interest rate differential.

On Malaysia Government bond, Awaludin & Masih (2015) shows that when US 10-year government bond yield increases, investors are expected to react and to rebalance their position by selling their holding in 10-year Malaysia Government bond to shift their investment back to US Dollar which is giving higher yields as to adjust to their risk premium back to the acceptable level. The decision by the investors may also be driven by the expectation that Bank Negara Malaysia may revisit its monetary policy adjusting to the necessary structural changes in the global market. The increase in US Treasury will result in its yield to be more attractive for investment holding

Mustafa et al. (2013) assessed Malaysia stock and bond market from 2006 to 2011 and concluded there is a flight to quality movement from stocks in Malaysia to bonds especially its government bond. Highlighting the global financial market from 2007-2009, Mustafa et al. (2013) found that a high negative correlation between government bond especially MGS and the Malaysia stock market exists. This result shows that investors in the Malaysian market tend to invest in government bond during a global financial crisis. As the VIX index can measure the investment sentiment, it can provide an indicator for investors fleeing their investment from stock to bond where investors can rebalance their portfolio by monitoring VIX closely.

The research in BNM Annual Report (2012) on the variance decomposition approach shows the significant co-movements between foreign government bond yields and the Malaysia Government bond (MGS) yields covering a period of the global financial crisis, 2007 - 2009. In terms of the long-term yields, it appears that both regional and advanced markets collectively contribute about 80% of the total variations in the long-term MGS yields. For the short-term MGS yields, the regional and advanced markets together contribute over two-third to the total variations in MGS yields.

In conclusion, Malaysia's government bond market has a certain level of global market integration. Therefore, any adverse global market sentiment will impact the domestic bond market despite local's fundamentals remain unchanged.

2.5 Relationship Between Investor Sentiment and Bond Yield

Among the most used indicator for investor sentiment is the VIX Index which indicates the proxy for investor sentiment, risk, and uncertainty (Feyen et al., 2015). VIX index is the measure of implied volatility, and the measure of contemporaneous volatility which is constructed using intraday squared S&P 500 returns. Becker et al.'s (2009) study found a significant negative impact of market volatility on the bond spread. Furthermore, Jubinski et al. (2012) suggested that a corporate bond is equivalent to a short put option on the equity of a company. Therefore, any individual corporate bond's yield should be positively related to an increase in firm value volatility. This is because an increase in idiosyncratic volatility increases the probability of issuer default.

The VIX index is very sensitive to global financial market disturbances such as the subprime crisis that surfaced in 2007 and US Quantitative Easing 2011 (Schwert, G. W., 2011, Duca et al., 2016). Hence, VIX should be able to represent the investor sentiment as it reflects the global

financial crisis. In the era of increasing global uncertainty, investors have too many data points to monitor and this study will help them to predict the domestic bond market yield movement measured by the VIX index to a certain extent.

Duca et al. (2016) employed VIX as an indicator of global market sentiment to measure the impact of US quantitative easing on the bond market and found that market sentiment represented by the VIX Index does impact the bond market. Furthermore, Bilgin et al. (2018) found that the VIX index is a robust indicator of global market sentiment across other financial assets as it also has a positive response to changes in the gold price.

On the other hand, Passari et al. (2015) provided evidence of an inverse relationship between the financial market cycle and VIX. In a study on hedging strategies of bond portfolios using VIX futures, empirical research by Luo et al. (2011) showed that the demand for bonds from emerging markets tends to be negatively affected by VIX increases, while results are non-conclusive in the case of advanced economies. Furthermore, Bruno et al. (2013) documented the impact of the VIX on bond flows. The study shows that investors in developed economies react to pursue higher yield which contributed to the decline in the risk premium for the debt market domestically and higher issuance of international debt.

To conclude, there is a significant relationship between the VIX Index and the bond yield. For instance, Chiang et al. (2015) found that stock and bond relationship in advanced markets like the US and Europe are negatively correlated to the VIX index as a measure of global market sentiment. This was due to the fact that the high VIX index represents heightened fear and investors will react to protect its investment during such time. Furthermore, bond market have a strong relation with flight to safety phenomenon as seen in Chiang et al. (2015) where in the US, investors will exit the equity market and enter the bond market during crisis to protect their investment.

2.6 Relationship Between Currency and Bond Yield

Afonso et al. (2015) illustrated that currency is one of the main drivers of domestic government bond yield movement. The research found that the relationship between currency is significant to bond yield as a weakening exchange rate can be an early indicator of the heightened fiscal stress which in turn also increases the credit risk. González et al. (2008) further supported the importance of the country's fiscal position to its local currency government bond yield as the investor will add the premium to bond yield according to the country's financial situation. Booth et al. (2007) also showed that there is a significant relationship between local fiscal position such as debt and deficit level to government bond yield.

Another interesting research found by Gadanez et al. (2014) demonstrated that local currency bond yield in an emerging country's economy moves in parallel to its foreign currency pairing. This shows the impact of foreign exchange on local currency bond yield movement is significant, hence reflects the importance of managing exchange rate risk as it influences domestic asset pricing. Gadanez et al. (2014) also mentioned that factors impacting the exchange rate itself are very similar to factors influencing bond yield which shows currency as a very suitable variable to study its relationship to bond yield movement in Malaysia.

(Afonso et al., 2015) assert that a positive relationship exists between bond yield and currency appreciation in emerging market which supports (Gadanez et al., 2014)'s findings on the existence of causality running from changes in currency to the domestic bond yield. Moreover, the studies conducted on the Malaysia government bond shows a significant relationship between foreign exchange rate USD/MYR with MGS (Muharam, 2013). This was further supported by Choy et al. (2019) which discusses that Malaysia currency depreciation leads to a weaker fiscal position and inflation which later affects demand for higher government bond yield due to an increase in default risk. Choy et al. (2019) also discussed that a positive relationship between currency and Malaysia Government bond may also be due to high foreign

investor holdings of domestic government bond, MGS. These relationships will lead to the Malaysia Government bond yield becoming more sensitive to fluctuations in US\$MYR currency movement.

2.7 Relationship Between Oil Price and Bond Yield

There has been a considerable amount of research showing oil price changes do impact stock price (Kilian, 2009; Wang et al., 2013) but it is worth to highlight the research by Wang et al. (2013) which mentioned the effect of oil price shock to the stock market of countries varies depending on whether the countries are importing or exporting oil. Nonetheless, the relationship between oil and bond market studies by Kang et al. (2014) showed that oil price has a significant relationship with the bond market return in the US. The significant relationship findings by Kang et al. (2014) are supported through the study by Lee et al. (2002) that indicated the bond market return does react to changes in oil price.

Furthermore, Woertz's (2008) studies on the Gulf Cooperation Council (GCC) bond market found that the volatility in the bond yield spread between sovereign Sukuk and conventional bond caused by changes in oil price is statistically significant. In addition, the research found that Sukuk investors in the GCC countries are sensitive to the changes related to the oil price. This supports our hypothesis on the importance of changes in the oil price to a sovereign bond in Malaysia due to its reliance on oil revenue similar to GCC countries.

Meanwhile, Kang et al. (2014) asserted that there is a statistically significant spillover connecting oil price to the bond market in the US during the heighten of the financial crisis in 2008. This, therefore, suggests the significant relationship between oil price and bond market especially in net exporter country like Malaysia as a positive shock in oil price can improve

Malaysia fiscal income which also lowers its credit default possibilities and ultimately, improve the government bond yield.

There are multiple studies conducted on the impact of oil price changes on the stock market in Malaysia and other emerging countries (Al-hajj et al., 2018; Raza et al., 2016) yet there is a lack of research on the impact of oil price movement to Malaysia bond yield. This research hopes to contribute to this front.

2.8 Relationship Between Gold Price and Bond Yield

Even though gold has limited use as a commodity, research suggests the importance of gold as a monetary role similar to currency (Ciner et al., 2013). This is supported by (Baur & Lucey, 2010) which finds Gold as a good safe-haven asset during a financial crisis thus suggested the important relationship between gold, bond and stock.

In the same strand of literature, Baur & Lucey (2010) showed that gold and bond returns are positively correlated in US and UK markets using time-varying beta regression. Echoing the study, Ciner et al. (2013) provided evidence that a significant positive relationship exists between the gold price and bond price in the US. Ciner et al. (2013) suggested that the positive relationship between bond and gold in the US exists due to investors' regards for both bond and gold as a hedging mechanism during a crisis which is in line with findings by Chiang et al. (2015) on investors' flight to safety behavior in the US.

Another angle to look at the relationship between gold and bond is through changes in expected inflation. McCown et al. (2006) provided evidence that changes in the gold price as a proxy for changes in inflation expectation is significantly correlated with future inflation and gold price. This suggests that investors will purchase gold if there is an expectation for inflation to increase as investors are trying to protect against the decrease of asset value. Meanwhile, Blose et al.

(2010) found that bond yield in the US is affected by unexpected changes in inflation and higher expected inflation which will cause a higher interest rate and thus increases the bond yield to incorporate the new rate of inflation.

On the Malaysia front, Ziaei et al.'s (2012) study found a significant impact of the gold price on Malaysia bond yield. As there is a few research available that addresses the relationship between the gold price and Malaysia bond yield, this research hopes to contribute more on this front.

2.9 Summary

Table 2.1 Summary of Bond Yield Determinants

Authors	Market Sentiment (VIX Index)	Exchange Rate	Oil Price	Gold Price
Barrios et al., 2009 Bruno et al. 2013 Chiang et al., 2015) Duca et al., 2016 Jubinski et al., 2012 Luo et al., 2011	x x x x x x			
Afonso et al., 2015 Choy, 2019 Gadanecz et al., 2014 Muharam, 2013		x x x x		
Kang et al., 2014 Lee et al., 2002 Woertz, 2008			x x x	
Baur & Lucey, 2010 Bilgin et al., 2018 Ciner et al., 2013 Ziaei et al., 2012				x x x x

There have been studies done on the respective relationship between the variables and bond market as illustrated in table 2.1. However, on top of the need for more updated research, there is a lot of gaps to fill in the Malaysia bond market. This research hopes to address this matter.



CHAPTER 3

DATA & METHODOLOGY

3.1 Introduction

This chapter will introduce the data to be used in this study together with the justification in selecting each of the variables. This chapter will also highlight the methodology employed.

3.2 Research Framework

This study seeks to analyze the impact of global determinants on the Malaysia government bond yield. The government bond yield movement is an important measurement, not only on the return of investing in a bond but also for market confidence and investors' sentiment due to its almost zero-default risk nature. In a situation where confidence is high, the bond yield will increase as investors believe that they can get a better return in investing in a riskier asset and when the confidence is low, the yield is expected to decrease.

To undertake this research, this paper will use Malaysia Government Bond (MGS) 10-year yield as a dependent variable and VIX Index, USDMYR foreign exchange, oil price and gold price as the independent variables.

Malaysia Government Bond (MGS) government bond is important as it is considered the risk-free interest rate benchmark as the government guarantee the return of investment. Furthermore, government bond comprised of 57% of outstanding bond in Malaysia as of July 2019 (bixmalaysia, 2019) which can represent the majority bond outstanding in market compared to corporate bond. Furthermore, the MGS 10-year yield is widely used to represent the Malaysia bond market as seen in (Awaludin & Masih, 2015; Choy et al., 2019).

VIX Index is a proxy to capture the volatility of the S&P 500 index (Becker et al., 2009; Jubinski et al., 2012) which reflects the investors market sentiment. The increase in the index represents a heightened risk sentiment and a decrease shows an improvement in investors' sentiment.

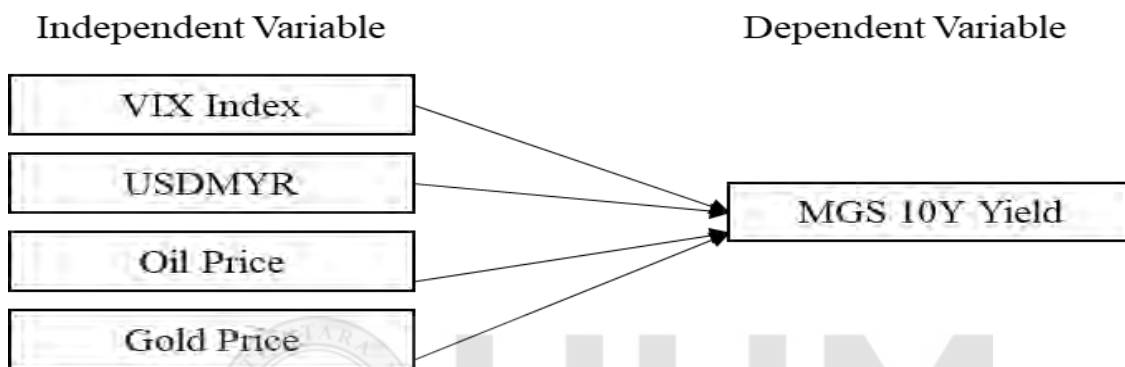
Another independent variable is the USDMYR foreign exchange. It is the exchange representing the ringgit movement against the US Dollar. An increase in the USDMYR means Ringgit is devaluing to Dollar. This exchange is important because when Ringgit devalue, it will drive investors away from holding Ringgit asset, especially for the foreign investors as it is also devaluing its fixed asset. Furthermore, since the VIX Index is based on S&P 500 stocks future in the US, a USD comparison to Ringgit Malaysia is relevant. A study by Afonso et al. (2015) shows that currency is one of the main drivers to local currency government bond yield movement. Furthermore, a study by Muharam (2013) and Choy et al. (2019) found a statistically significant relationship between Ringgit Malaysia currency with Malaysia Government Bond, MGS.

The next independent variable is the oil price per barrel. This research will employ Crude Brent oil price as an indicator which is used by Kang et al. (2014) as a representative for the oil price. Malaysia being an oil exporter shows its vulnerability to changes in oil price. Based on the study in GCC countries by Woertz (2008) which is an oil net exporter like Malaysia, it showed that Islamic corporate bond or Sukuk investors are very sensitive to changes in oil price. This research will try to investigate the relationship between changes in the oil price to the Malaysia Government bond in the long run and short run.

Another important global indicator is the gold price which will be used as an independent variable in this research. Gold price is important to represent as a global determinants due to its representative as a safe-haven asset to investor (Baur & Lucey, 2010) and changes in the

global investor sentiment will impact gold price and this may have a spillover impact on other financial markets like bond market. The study by Ciner et al. (2013) found that there is a positive relationship between the gold price and bond market in the US and UK market. This research will be widely used as a representative of gold price per ounce in USD as seen in (Ciner et al., 2013; Baur & Lucey, 2010).

Figure 3.1 Research Framework



3.3 Data

This study uses monthly data from January 2008 to July 2019. The details of the data employed are as below:

Table 3.1 Data Summary

Data	Measurement	Sources	References
Malaysia Government Bond Yield	10 Year Malaysia Government Securities (MGS) Yield	Bank Negara Malaysia Website	(Chernov et al., 2019), (Awaludin and Masih, 2015), (Mustafa et al, 2013), (Gadanecz et al., 2014)
Investor Sentiment	VIX Index	Bloomberg	(Duca et al., 2016), (Chiang et al., 2015), (Muharam, 2013)

Foreign Exchange	USD/MYR	Bloomberg	(Gadanecz et al., 2014), (Muharam, 2013)
Oil Price	Crude Brent Oil Price at USD per Barrel	Bloomberg	(Raza et al., 2016), (Kang et al., 2014)
Gold Price	Gold Price USD per Oz	Bloomberg	(Raza et al., 2016), (Ciner et al., 2013)

3.4 Model

This paper employs time series analysis as a method to determine the long-run and short-run relationship between global determinants and Malaysia Government Bond. This paper uses Johansen's (1991) study and method as a guideline in testing the long-run and short-run relationship between the variables. The dependent variable is MGS 10-year Government Bond (MGS10Y) while the variables are the VIX Index (VIX), the USDMYR foreign Exchange (USDMYR), OIL PRICE (OIL) and gold price (GOLD). The model is represented as below.

$$MGS10Y = F(VIX, USDMYR, OIL, GOLD)$$

$$MGS10Y_t = \beta + \beta VIX + \beta USDMYR + \beta OIL + \beta GOLD + \epsilon_t \dots \dots \dots (3.1)$$

where,

MGS10Y = MGS 10- year bond yield

VIX = VIX Index

USDMYR = USDMYR Foreign Exchange

OIL = Oil Price

GOLD = Gold price

ϵ = error term

t= time

In order to determine either the variables are stationary or not, the Unit Root Test is employed. The Unit Root Test that will be used in this study is Augmented Dickey-Fuller (ADF). After determining the nature of the variables, we will use Johansen cointegration analysis in

determining the cointegration relationship between the variables. From the result of the cointegration test, we will then decide to perform vector autoregression (VAR) or vector error correction model (VECM) to estimate the long-run effect of one series to another. Thirdly, we will measure the Granger causality test to see the possible causal relationship between the variables and finally estimate variable decomposition on each independent variable to the dependent variable to assess the short-run relationship.

3.5 Unit Root Test

In studying the nature of the data on its unit root argument, we will apply the Augmented Dickey-Fuller (ADF) test. The ADF test will augment the equation by adding the dependent variable lagged value. Below is the ADF test formula by estimating regression:

$$\Delta x_{it} = \mu_0 + \mu_1 t + (\rho - 1)x_{i,t-1} + \sum_{k=1}^p r_k \Delta x_{i,t-k} + e_t \dots \dots \dots (3.2)$$

Where μ_0 is the constant term, $\mu_1 t$ is a linear deterministic trend in the data, $(\rho - 1)x_{i,t-1}$ correspond stochastic trend and residual, e_t . The amount of lagged difference is often determined observation wise. The plan is to include terms in order of error in the equation as uncorrelated. ADF test follows the same distribution as the DF statistic where ADF, $\mu_1 = 0$ which makes the same critical value can be used. The null hypothesis is that the data is not stationary, hence if the hypothesis is rejected, the data is stationary. The test will be done at a level and first difference to see if the data is stationary at level, 1st difference or both. If the data is non-stationary but stationary at 1st difference, we will undertake the Johansen cointegration test.

3.6 Cointegration Test

Cointegration requires the data to be non-stationary. After the unit root test determine if the data is stationary or not, we have to check if there is cointegration between the variables. If the variables are cointegrated between them, it means that the variables have a long-run relationship. This can be checked by using Johansen & Juselius' (1992) cointegration test. This cointegration test will determine the number of cointegration vector and reveal the presence of causality without knowing the causality direction. However, if any of the variables have a common trend and cointegrating, causality must exist in either direction.

Then, we use two test statistics of co-integration which are the Trace test statistics and Max Eigenvalue statistics, in order to determine the number r , co-integrating vector. The analysis will follow this equation:

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^g \ln(1 - \hat{\lambda}_i) \dots \dots \dots (3.3)$$

$$\lambda_{max}(r, r + 1) = -T \ln(1 - \hat{\lambda}_{r+1}) \dots \dots \dots (3.4)$$

To start the cointegration test, the null hypothesis if no cointegration ($r=0$) is created among the variables. Then, if Trace statistic and Max Eigenvalues exceed the critical values, this study will reject the null hypothesis of no cointegration. This means that the coefficient values of each independent variable are not equal to zero. Therefore, there is cointegration between the variables.

3.7 VECM

Once the existence of cointegration is established between the variables, we will then continue to either use Vector Auto Regression (VAR) method if there is no cointegration or using Vector Error Correction Model (VECM) if there is cointegration between the variables. Adam & Tweneboah (2009) found that cointegration techniques will be useful in examining the long-

run relationship between variables if its variables are stationary at first difference. Therefore, this study will examine the relationship between the variable using VECM if the data is stationary at the first difference and cointegration exists between the variables.

The original regression of long-run relationship of variables (Johansen, 1991) in the form of the Vector Autoregression (VAR) model is as below:

$$x_t = \Gamma_1 x_{t-1} + \dots + \Gamma_k x_{t-k} + \mu + \varepsilon_t \dots\dots\dots (3.5)$$

Where the ε_t is the independent variable and parameter Γ and μ a vector of a constant term and each Π_τ is an $(N \times N)$. However, when the VAR equation in equation 3.5 written in error correction form (ECM), it changes to below:

$$\Delta x_t = \Gamma_1 \Delta x_{t-1} + \dots + \Gamma_k \Delta x_{t-k} + \mu + \varepsilon_t \dots\dots\dots (3.6)$$

where,

$$\Gamma_j = \Pi_1 + \dots + \Pi_k - I$$

$$j = 1, \dots, k$$

Δ = The first difference

x_t = Variable integrated of order 1, I(1)

μ = Lag structure

ε_t = Error terms

Π_τ represents the long-run impact matrix at a level solution to equation 3.5 which decide the cointegration vector between the variables. Equation 3.6 represent the error correction model from the VAR model which can be interpreted as a relationship between dependent and independent variables. It represents the linear function of previous variable changes between the variables. The long-run residual measures the speed of adjustment to equilibrium at each moment and to adjust instantly to new information for the short-run analysis. However, the VECM regression does not indicate the causality direction of each variable. Further analysis



using the Granger causality test will be done to examine the causal direction between the variables.

3.8 Granger Causality

It is necessary to identify the relationship between the variables. A general econometric test may not be able to explain the results and may be biased. The Granger Causality test (Granger, 1969) is one of the most famous used tests in the context of VAR or VECM. The existence of the relationship from running VAR or VECM does not prove the direction of influence. In regression, variable X and Y may be significant but we need to determine if the X causes Y or Y causes X. This test will determine if the relationship is significant.

3.9 Variance Decomposition

Having examined the long run and short run relationship between variables, we will then measure the reliability of each independent variable in explaining the dependent variable. The variance decomposition indicates the percentage of forecast error in each variable can be attributed to other variables at the short-run horizon (Campbell, 1991). This test will be used to summarize the short-run response of the variables to dependent variables (Lutkepohl & Reimers, 1992).

CHAPTER 4

RESULTS & DISCUSSIONS

4.1 Introduction

This chapter presents the research findings based on the methodology discussed in the previous chapter. This chapter will first explain the descriptive analysis and correlation test on the data. It will examine the data starting with the unit root test and followed by the cointegration test. The result from cointegration will then be used to decide to undertake the Vector Auto Regression (VAR) model or Vector Error Correction Model (VECM) to examine the significant long-run relationship. Further variance decomposition will conduct the model to determine the impact of Independent Variable to Dependent Variable and finally Granger causality test to examine the significant and causality direction of each variable pairwise in the short run. The research will also assess the validity of the model by running a residual and stability test.

4.2 Descriptive Analysis

Table 4.1 below summarize the descriptive analysis of individual data. The average MGS 10-year yield is 3.91% with a median of 3.92%. The average of VIX Index, currency, oil and gold are at 19.68 points, RM3.58 per 1 USD, USD 81.03 per barrel and USD 1,268.20 per Oz respectively. The data have 139 observations.

MGS 10-year data have a minimum yield value of 3.07% and a maximum yield value of 4.84% as summarized in Table 4.1. VIX Index, currency, oil and gold indicate a minimum value of 9.51 points, RM2.96 per 1 USD, USD34.74 per barrel and USD760.86 per Oz respectively.

Meanwhile, the maximum values of the VIX Index, currency, oil and gold are 59.89 points, RM4.49 per 1 USD, USD139.83 per barrel and USD1,771.85 per Oz respectively.

The summarize of data as per table 4.1 shows the data covers a very big fluctuation of pricing for some while very stable pricing for others depending on the variables. The oil price hikes to its maximum at USD139.83 per barrel while drops to its lowest at USD34.74 per barrel within the research period. Meanwhile, the Government bond yield is quite stable averaging at 3.9% with a maximum of 4.84% and a minimum of 3.07%.

Table 4.1 Descriptive Analysis

	MGS10Y	VIX	USDMYR	OIL	GOLD
Mean	3.91324	19.68475	3.58032	81.03964	1268.19800
Median	3.92000	17.06000	3.42450	75.47000	1261.26000
Maximum	4.84000	59.89000	4.48600	139.83000	1771.85000
Minimum	3.07000	9.51000	2.95550	34.74000	760.86000
Std. Dev.	0.29707	8.79503	0.46796	26.18162	230.19450
Skewness	0.11760	2.02128	0.42332	0.13030	0.18317
Kurtosis	3.61581	7.89006	1.67958	1.71223	2.90063
Observations	139	139	139	139	139

4.3 Correlation Test

Table 4.2 summarize the correlation relationship between the variable. The result shows that MGS10Y have a positive relationship with VIX and USDMYR while having a negative relationship with both Oil and Gold.

Table 4.2 Correlation Test

	MGS10Y	VIX	USDMYR	OIL	GOLD
MGS10Y	1.0000	0.0219	0.2624	-0.0936	-0.5198
VIX	0.0219	1.0000	-0.2282	-0.0696	-0.3778
USDMYR	0.2624	-0.2282	1.0000	-0.8156	-0.3090
OIL	-0.0936	-0.0696	-0.8156	1.0000	0.4444
GOLD	-0.5198	-0.3778	-0.3090	0.4444	1.0000

4.4 Unit Root Test

The unit root property of the data series is very important for the cointegration and regression because it will examine the stationary property of the data. Table 4.3 shows the result of the unit root test using Augmented Dickey-Fuller (ADF). The unit root tests reveal that all the data is non-stationary at level but stationary at 1st difference.

Table 4.3 Unit Root Test

Variables	Level	First Difference
MGS10Y	Non stationary	Stationary
VIX	Non stationary	Stationary
USDMYR	Non stationary	Stationary
OIL	Non stationary	Stationary
GOLD	Non stationary	Stationary

4.5 Cointegration Test

Before running the cointegration test, there is a need to determine the choice of lag before running the cointegration test based on certain criteria. The three most used criterion to decide the lag are the Akaike Information Criterion (AIC), Schwarz Information Criterion (SC) and Hannan-Quinn Information Criterion (HQ). From the result in table 4.4 below, this research will use lag 1 as its lag length for the cointegration and regression.

Table 4.4 Optimal Lag Length Criteria

Lag	AIC	SC	HQ
0	28.91751	29.02725	28.9621
1	19.61893	20.27737*	19.88648*
2	19.50538*	20.71252	19.9959

* Indicates lag order selected by the criterion

Table 4.4 shows that all the data in the series stationary at 1st difference and integrated at same order I(1), the Johansen Cointegration test is performed to examine if cointegration exists between MGS, VIX index, currency, oil price and gold price and the result presented in Table 4.5. In the table, the Johansen Trace statistic and maximum Eigen statistic for all 5 variables indicate that the null hypothesis of no cointegration can be rejected at a 5 percent significance level which means that the alternative hypothesis of more than one cointegration vector can be accepted. Both the Trace test and Max Eigenvalue test indicate 2 cointegration equations exist at a 5 percent critical value. This supports the hypothesis of the existence of a stable long-run relationship between the variables.

Table 4.5 Johansen Cointegration Test

H(R)	Trace Test			Max Eigenvalue Test		
	Statistic	0.05 CV	Prob	Statistic	0.05 CV	Prob
R = 0	89.50671	69.81889	0.0006	38.72515	33.87687	0.0122
r ≤ 1	50.78156	47.85613	0.0259	32.13456	27.58434	0.0121
r ≤ 2	18.64700	29.79707	0.5185	12.28647	21.13162	0.5196
r ≤ 3	6.360526	15.49471	0.6529	5.716007	14.2646	0.6499
r ≤ 4	0.644519	3.841466	0.4221	0.644519	3.841466	0.4221

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level

4.6 Vector Error Correction Model (VECM)

After confirming the existence of cointegration between the MGS, VIX, currency, oil and gold, the data will be run using Vector Error Correction Model (VECM) to examine the long-run relationship between the variable.

Table 4.6 Vector Error Correction Model

Variable	Coefficient	Standard Error	T-Statistic
MGS10Y	1		
VIX	0.02018	-0.00566	3.56306
MYRUSD	0.08584	-0.16087	0.53357
OIL	-0.00214	0.00281	-0.76351
GOLD	0.00121	0.00020	6.16601
C	-5.97981		

The VECM result in table 4.6 showed the presence of a negative long-run equilibrium relationship between Malaysia Government bond and VIX which is statistically significant at 5 percent level with the speed of adjustment of disequilibrium is at 356 percent. Another statistically significant at 5 percent relationship is between the Malaysia Government bond and Gold where the long-run relationship is also negative. The speed of adjustment in the Gold equation is fast at 617 percent of disequilibrium from the previous period shock converge back to long-run equilibrium in the current period. Based on the result in table 4.8, we can write up the cointegration equation and the long-run model as below.

$$ECT_{t-1} = 1.000MGS10Y_{t-1} + 0.0202VIX_{t-1} + 0.086USDMYR_{t-1} - 0.002OIL_{t-1} + 0.001GOLD_{t-1} - 5.980ECT_{t-1}$$

Based on the result from VECM, VIX and Gold have a significant long-run relationship with Malaysia Government bond whereby an increase of one percent of VIX and Gold will decrease MGS by 2 percent and 0.1 percent respectively. This result means that an increase in global risk aversion will decrease Malaysia government bond yield, reflecting an increase in bond value. The result can be explained by the flight to safety theory by Spyros (2013), where investors will move to a haven asset such as a bond when investor sentiment change risk-averse. Furthermore, Ziaei et al.'s (2012) research found a significant long-run relationship between gold and bond while Jaramillo et al. (2013) supported the significant relationship

between VIX and bond market in emerging economies especially when the market is on the edge.

4.7 Granger Causality

After confirming the existence of the long-run relationship, this research will use a pairwise Granger Causality test to examine the short-run relationship between VIX, currency, oil and gold price movement to Malaysia government bond yield. The result from the causality test in table 4.7 shows a significant causality direction from VIX to Malaysia Government bond and Oil to Malaysia Government bond. Based on the result, we can reject the null hypothesis of VIX and Oil price does not granger cause Malaysia Government bond in the short run.

Figure 4.1 Short-Run Relationship

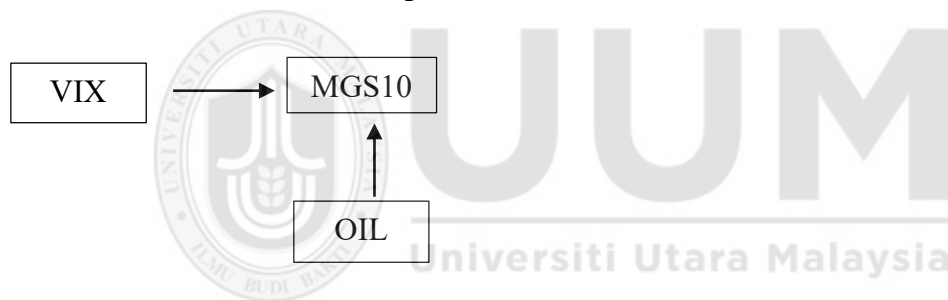


Figure 4.1 above shows that the VIX index granger cause Malaysia bond yield. This supports our hypothesis that the Malaysia bond market is affected by global investor sentiment. As VIX represents global investor sentiment, a bad sentiment due to something happening far away from Malaysia can now largely impact the Malaysia bond market. This supports the study (Baldacci & Kumar, 2010) in the advance market like the US and Euro that the VIX Index has a very significant relationship to bond yield movement.

Moreover, the result also shows that oil price granger causes Malaysia bond yield. This supports the hypothesis of the significant impact of oil price on the Malaysia bond market. The short-run relationship shows Malaysia bond investors are sensitive to changes in oil price. This result supports the study by Raza et al. (2016) of GCC countries where he finds a significant

relationship between changes in the oil price to Islamic bond or Sukuk. The relationship in the short run also shows that if the country is dependent on oil income or net exporters like Malaysia or GCC countries, the impact is much faster before reaching equilibrium.

Table 4.7 Pairwise Granger Causality Test

Null Hypothesis:	F-Statistic	Prob.
DVIX does not Granger Cause DMGS10Y	6.49438	0.002*
DMGS10Y does not Granger Cause DVIX	0.75165	0.4736
DUSDMYR does not Granger Cause DMGS10Y	0.98308	0.3769
DMGS10Y does not Granger Cause DUSDMYR	0.32334	0.7243
DOIL does not Granger Cause DMGS10Y	7.53708	0.0008*
DMGS10Y does not Granger Cause DOIL	0.19392	0.824
DGOLD does not Granger Cause DMGS10Y	0.56128	0.5718
DMGS10Y does not Granger Cause DGOLD	1.29982	0.2761

* Indicates Statistical significance at 5%

4.8 Variance Decomposition

Table 4.8 shows the result of variance decomposition and indicates the percentage of forecast error in each variable can be attributed to other variables at the short-run horizon (Campbell, 1991). The result indicates that 100% of MGS yield movement can be interpreted by the current MGS yield in the current period and reduced gradually throughout the 10 periods. However, VIX continues to contribute a significant impact to MGS yield by 22.46% at the end of the 10th period which supports our previous findings in 4.6 and 4.7. The study believes that the

significant contribution of VIX impacting Malaysia bond shows that global investor sentiment does impact Malaysia bond market significantly as VIX is sensitive to global financial market disturbances such as the Asian currency crisis in 1997, the subprime crisis that surfaced in 2007, US Quantitative Easing 2011 and Trump-China trade war 2019. Moreover, this result supports Qadan & Cohen's (2011) study where the research finds that VIX is better at predicting the movement of the bond market than the equity market due to the significant relationship between the previous day VIX return to the next day of US treasury trading.

Based on the Variance decomposition analysis in Table 4.8, gold and currency also are found to have a positive relationship to Malaysia government bond yield at 0.91% and 0.70% at the 10th period after VIX Index. Despite the small significance, the analysis results support the study by Ziaei et al. (2012) which finds a significant relationship between the gold price and Malaysia bond yield and a positive correlation relationship between bond and gold market. In addition, the results are also consistent with the findings of Afonso et al. (2015) which illustrated that currency is one of the drivers to local currency government bond yield movement. The research found that the significant positive relationship between currency and bond yield as a weakening exchange rate can be an early indicator of the heightened fiscal stress which also increases the credit risk and therefore lead to a higher bond yield.

Nonetheless, it is also important to mention despite oil only contributes 0.19% to MGS at the end of the 10th period, it is also the only variable besides the VIX index that provides short term direction movement to MGS bond yield as per the result discussed in 4.7.

Table 4.8 Variance Decomposition test

Period	S.E.	DMGS10Y	DVIX	DUSDMYR	DOIL	DGOLD
1	0.21718	100.00000	0.00000	0.00000	0.00000	0.00000
2	0.24583	90.53765	8.28777	0.71164	0.05097	0.41197
3	0.29592	79.58013	18.98579	0.50755	0.30547	0.62105
4	0.32335	78.82336	19.36663	0.75039	0.28678	0.77285
5	0.35401	78.86448	19.44543	0.66828	0.26474	0.75707
6	0.37998	77.64257	20.59591	0.71237	0.22995	0.81920
7	0.40571	76.84757	21.39917	0.69013	0.21234	0.85079
8	0.42883	76.45539	21.77306	0.70305	0.19099	0.87752
9	0.45128	76.12684	22.10907	0.69472	0.17659	0.89279
10	0.47247	75.77301	22.45536	0.69760	0.16327	0.91077

4.9 Diagnostic Test

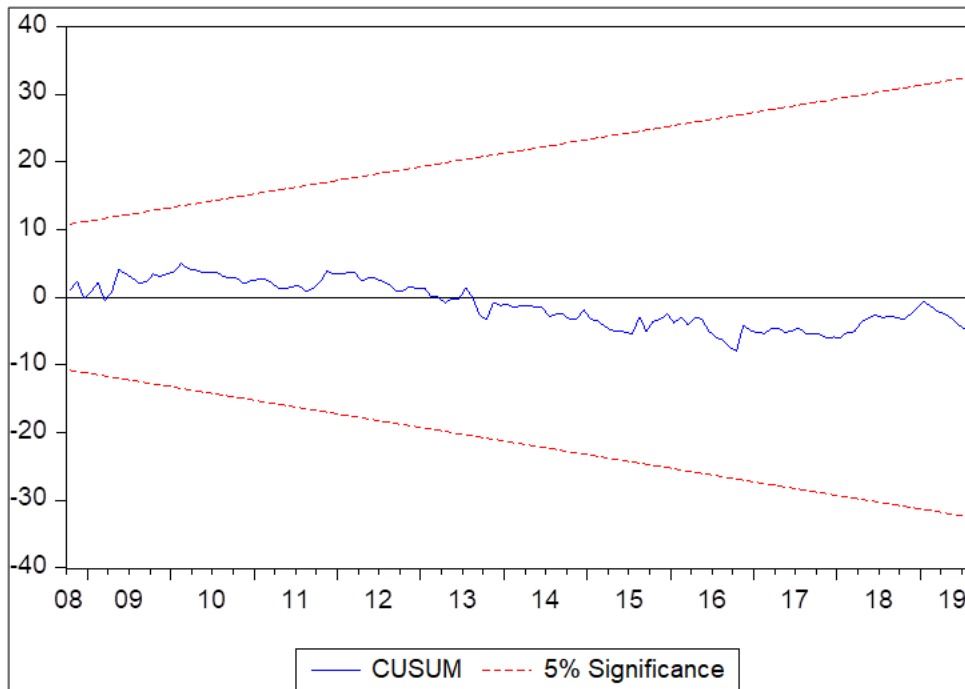
A further diagnostic test will be done on the regression model to examine if the result is acceptable. Based on the regression model, we run the Breusch Godfrey Serial Correlation test in Table 4.9 to determine if the model suffers from serial correlation and the result shows both probabilities at above 0.05. We can then reject the null hypothesis of the model suffering from serial correlation and the result is desirable.

Table 4.9 Serial Correlation Test

Breush Godfrey Serial Correlation test			
F Stats	1.167801	Prob F	0.3143
Obs*R-squared	2.455027	Prob Chi-Square	0.293

We will then examine the stability of the model using the CUSUM test. The CUSUM test will examine if the regression model is stable under the 5% significant frame. The result shows in Graph 4.1 shows that the model used in the studies is statistically stable within the acceptable range.

Table 4.10 CUSUM Test



4.10 Summary

This chapter covers the data analysis and discussion on the findings. The first part of this chapter outlining the descriptive statistic of the data used in this modelling. The model then undertakes the correlation test before proceeding with the unit root test. Results from the unit root test than undertake the cointegration test. The results from the cointegration analysis show the data suitable to proceed with the Vector Error Correction Model (VECM) to test for a long-run relationship. The study then runs Granger causality for short-run analysis. The study then proceeds with variance decomposition before ending with some diagnostic test.

Generally, the results show that the bond market has a statistically significant relationship with global investor sentiment and gold price in the long run. Meanwhile, for the short-run analysis, the VIX index remains the most significant relationship followed by gold price, currency and oil using variance decomposition analysis. For Granger causality, the results of this present study found a unidirectional relationship running from VIX and oil price to MGS. Nonetheless

in the short run, currency, gold price and oil price have a less significant impact on MGS compared to 0.70%, 0.91% and 0.16% respectively compared to VIX at 22.46% using variance decomposition analysis.



CHAPTER 5

CONCLUSION & RECOMMENDATION

5.1 Introduction

This chapter will summarize the impact of investor sentiment, currency, oil price and gold price on the Malaysia government bond. This chapter will also discuss the implication of the study and some of the recommendation for future research.

5.2 Summary of Findings

According to the analysis done in Chapter 4, there is a statistically significant relationship between investor sentiment and the Malaysia government bond in both the long-run and short-run analysis. This very much supports the previous research done by Chiang et al. (2015) and Luo et al. (2011) which revealed that during a heightened financial crisis, investors will react to protect their investment by moving their investment to safe-haven investments such as a bond. As VIX is represented as a measure of global market uncertainty, it is understandable that the relationship between bond yield and investor sentiment is significant. Furthermore, this research also finds that the investor sentiment granger causes bond yield which is also supported by Jaramillo, L., & Weber, A. (2013) which concluded that a significant relationship exists between VIX and bond market in emerging economies such as Indonesia, India and Thailand especially when the investor sentiment is bad.

The study also finds a significant relationship between gold price movement and the Malaysia government bond in the long-run and short-run analysis using variance decomposition. The result shows that an increase in the gold price will decrease the bond yield which then means the bond value increases. The result can be explained by the flight to safety theory as seen in

Spyros (2013), where investors will move to a safe-haven asset such as gold and bond when investor sentiment to market change unfavorably. However, there is no granger causality running between bond yield and gold price despite a significant result in its movement in the long run and short run.

Looking at the short-run analysis, the VIX Index has a significant relationship with the Malaysia government bond followed by the oil price. This study found a significant result that oil price granger causes Malaysia government bond yield movement in the short run. This echoed the study by Raza et al. (2016) of GCC countries where the study found a significant relationship between changes in the oil price to Islamic bond or Sukuk.

Finally, the study finds a significant short-run relationship between currency and Malaysia government bond yield. The result for currency is supported by Afonso et al. (2015) which shows that currency is one of the drivers to local currency government bond yield movement due to the fact that a weakening exchange rate can be an early indicator of heightened fiscal stress. Heightened fiscal stress increases the sovereign credit risk thus investor will demand a higher bond yield with the added risk. Moreover, the result also concurs with the results of other studies such as one by Choy et al. (2019) conducted on the Malaysia government bond which shows a significant relationship between foreign exchange rate USD/MYR and MGS. Besides that, Muharam (2013) and Choy et al. (2019) discussed the Malaysia currency depreciation leads to a weaker fiscal position which in turn affects investors pricing a higher yield due to an increase in default risk.

5.3 Contribution of the Study

The empirical findings in this study provide useful implication to the regulator, institutional investors, research analysts, and other investors when investing in the Malaysia bond market.

In the era of increasing global uncertainty such as US President Trump aggressive trade policy, China GDP normalization activity, Euro Quantitative easing, Oil price volatility and others may make the bond market to be less predictable. This research hopes to enable the investors to better predict to a certain extent the domestic bond market yield movement using linear regression analysis by incorporating variables such as VIX index, currency, oil price and gold price.

Furthermore, the study on the determinants of Malaysia bond yield has so far focused on macroeconomic variables such as interest rate and GDP (Choy et al., 2019). There are also other studies to examine the relationship between Malaysia bond yield and other advanced markets such as the US treasury (Awaludin & Masih, 2015).

Finally, most microeconomic data are only available on a monthly, quarterly or yearly basis. It is, therefore, more beneficial if the investors can use a more frequent data point such as VIX Index, currency, oil price and gold price as these data are available on daily basis and are more easily available. This study will allow investors and regulators to understand the determinants of the Malaysia Government bond to design policies to improve the efficiency of the bond market in Malaysia.

5.4 Limitations of the Study and Future Research

Despite the majority of outstanding Malaysia government bond is MGS, GII is also an important part of the Malaysia government bond. As the government continues to increase its percentage of Islamic issuance, it is recommended for future studies to include Islamic government bond in the variables. It is also interesting to see the separate impact of each variable like investor sentiment, currency, oil price and gold price to conventional and Islamic bond.

One of the limitations of the study is the duration of the data which is between 2008 to 2019. It is recommended to further the study by incorporating the data before 2008 or beyond 2019 in the future. Secondly, the literature study on Malaysia bond yield is scarce especially on the impact of investor sentiment, gold price and oil price on bond yield.

During the 2008 financial crisis, Malaysia is one of the countries which were heavily affected by portfolio investment outflows (Mustafa, 2013) and in 2016, MGS recorded historically high ownership of foreign holdings at 51.32% reported by Bank Negara Malaysia (BNM, 2017). As one of the findings of this study is the significant relationship between global investor sentiment and gold price to Malaysia Government bond, it will be interesting to see further studies on the impact of foreign investors flight to safety action to bond market yield movement or yield spread.



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