FLATTENING YIELD CURVE AMIDST RAPID INFLOWS: THE MALAYSIAN EXPERIENCE

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Abstract:

Movements in the yield curve reflect the interplay of monetary policy actions, various macroeconomic conditions as well as the demand and supply conditions in the bond market. We examined the observed periods of flattening of the Malaysian yield curve, paying additional attention to episodes that took place following the active efforts to develop the bond market beginning in the early 2000s as well as the financial liberalisation measures implemented after the Asian Financial Crisis. We also assessed the possible factors that contributed to the compression in yields. The various impact of increased foreign participation in the domestic bond market were also studied, both qualitatively and quantitatively. Specifically, it was found that foreign participation in the ringgit bond market is statistically significant in determining long-term sovereign yields. Finally, policy implications arising from the flattening yield curve phenomenon in Malaysia were also analysed.

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Keywords: Bond Market, Yield Curve, Portfolio Flows, Foreign Investors, Emerging Markets

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I. Introduction

One of the lessons from past crises affecting emerging markets is the importance of having a sound and relatively deep domestic capital market. As such, there has been a steady trend in emerging market countries, including Malaysia, of embarking on measures towards this direction. Furthermore, as the fundamentals of these economies grow stronger, gradual liberalisation of the financial systems has also been implemented. Consequently, as these markets become more developed and more integrated with one another, the dynamics between various events and factors have led to various unique circumstances and phenomena in the domestic capital markets.

In Malaysia, the flattening of the yield curve, particularly the Malaysian Government Securities (MGS) yield curve, or the narrowing in the maturity spread[2], is an interesting development that has been observed in the ringgit bond market. For the discussion throughout this paper, we define an episode of flattening of the yield curve as a period when the maturity spread for MGS with maturities longer than 5 years narrowed to a point where it was close to zero or turned negative, when the yield curve eventually inverts. These episodes of flattening of the yield curve had been triggered by a confluence of factors. Prior to 2000s, the levelling of the yield curve was largely driven by domestic factors, particularly domestic monetary policy. More recently, however, as the market became more liberalised, the flattening of the yield curve had been influenced mainly by the increase in foreign investors' participation in the ringgit bond market. This was particularly prevalent during periods when there was a surge in portfolio inflows by these investors.

This paper aims to conduct a thorough analysis on the occurrences of flattening yield curve in Malaysia, and the factors driving the phenomenon during each episode. The paper also aims to study the impact of rising foreign participation in Malaysia's bond market in recent years, from both a quantitative and qualitative perspective. Finally, the paper looks into past policy responses to the phenomenon of the flattening yield curve and considers possible policy options going forward.

[2] Maturity spread is the difference between the yields of two securities with different maturity, typically measured as the difference between long-term yields and short-term yields

Our analyses indicated that the periods of flattening yield curve prior to 2002 were impacted largely by domestic investors' responses to domestic monetary policy. Following pro-active efforts to develop the ringgit bond market and the implementation of foreign exchange (FX) liberalisation measures in the early 2000s, episodes of flattening yield curve were subsequently driven by the surge in portfolio inflows into the domestic bond market. One of the key factors that had attracted portfolio inflows into the ringgit bond market was the large size of Malaysia's bond market and its advanced development relative to other regional bond markets. Empirically, we found that foreign investors' participation in the domestic bond market has a *statistically significant* impact in contributing to the decline in bond yields. We also observed that to date, minimal policy responses were warranted to address the impact of the flattening yield curve in the short-run, but nonetheless, measures to continue to deepen the ringgit bond market should remain.

The remainder of the paper is structured as follows. Section II looks at the broad explanations and factors affecting the yield curve. Section III discusses Malaysia's experience with the flattening yield curve phenomenon pre- and post-liberalisation, while Section IV attempts to quantify the impact of rising portfolio inflows and increasing foreign investors' participation on domestic bond yields. Section V enlists the policy responses that had been undertaken by Bank Negara Malaysia (BNM) to address the phenomenon and possible measures going forward. Section VI concludes.

II. Overview of Factors Impacting the Yield Curve

There are three theoretical explanations[3] for the various shapes of the yield curve that could prevail at a point in time. An upward sloping yield curve, a shape that is typically observed, reflects investors' expectation for the economy to grow faster in the future, and this is generally consistent with the expectation for higher inflation and interest rates going forward. In addition, the positive slope incorporates the liquidity premium for holding longer-term bonds. A steep yield curve, indicated by a yield spread between long-term yield and short-term yield exceeding that of the historical average, typically occurs after a recession,

[3] Three major theories attempt to explain the shapes of the yield curve: (i) Pure expectations theory; (ii) Liquidity premium theory; and (iii) Market segmentation theory. See http://www.rethinkyourdefence.com.au/yield_curve_basics.asp?expand=1. For a more detailed explanation, see Brown and Reilly (2008), "Investment Analysis and Portfolio Management," South-Western College

and suggests that the economy is expected to expand quickly in the future. An inverted yield curve occurs when yields of the longer-term bonds exceed that of the shorter-term bonds, which indicates investors' expectations for slower economic growth in the future. Numerous works have been published to show the predictive power of an inverted yield curve as an indicator of recessions, particularly in the US, such as those of Estrella and Mishkin (1996), Estrella and Trubin (2006) and Wright (2006). Finally, a flat or a humped yield curve reflects uncertainties over the outlook of the economy. A flattening of the yield curve that is caused by a higher increase in the short-end of the yield curve, also known as a 'bear flattening', reflects policy tightening or an decrease in demand for short-term bonds, whereas a 'bull flattening', which is due to yields on the longer-end declining at a larger magnitude relative to the short-end, implying investors' preference for longer-term bonds.

While theoretical reasoning helps to explain the shape of the yield curve at a point in time, bond yields, and concurrently the yield curve, are also affected by various factors that could be externally or structurally driven. Analysing the determinants of government bond yields in the G-7 countries, Hauner and Kumar (2006) showed that capital inflows had contributed to the rising level of liquidity in the sovereign bond market and declining yields. Hol (2006) showed that bond yields in the Scandinavian countries were affected by both domesic macroeconomic as well as international economic conditions.

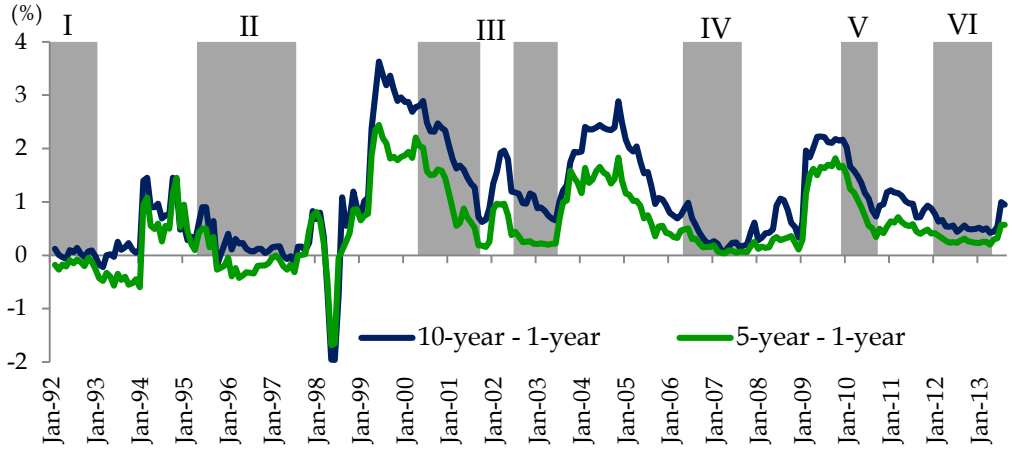
Of greater interest, the growing presence of foreign investors in emerging markets amidst the liberalisation of exchange control regime also has an impact on how the shape of the yield curve evolves. Earlier studies on emerging market bond yields showed that external factors play an important role in determining the yields' movements. Baldacci, Gupta and Mati (2008) estimated that emerging markets with larger capital inflows experienced smaller increases in their bond yields during periods even when their fiscal deficits expanded. Hartelius, Kashiwase and Kodres (2008) established that while macroeconomic fundamentals were important, expectations on US interest rates and changes in those expectations were also a key determinant in 33 emerging markets' bond yields. Moreover, the size and level of development of a country's debt market also played an integral factor in determining the prevailing form of the yield curve. Comparing the movements of 16 emerging markets' bond

spreads[4] in the 1990s to the period between 1870 and 1913, Mauro, Sussman and Yafeh (2002) showed that changes in spreads in the more recent period – that is, the 1990s, where the markets were more developed, tended to be related to global events. Challe, Le Grand and Ragot (2007) showed that a larger volume of transactions and activities in the bond market[5] pushed both the level and slope of the yield curve.

III. Malaysia's Experience with the Flattening Yield Curve

Since the early 1990s, there have been several episodes where the MGS yield curve moved away from the normal upward sloping curve. During these times, there was a noticeable flattening of the yield curve, and, at times, a brief inversion of the yield curve [Figure 3.1 and Figure 3.2].

Figure 3.1: MGS Maturity Spread

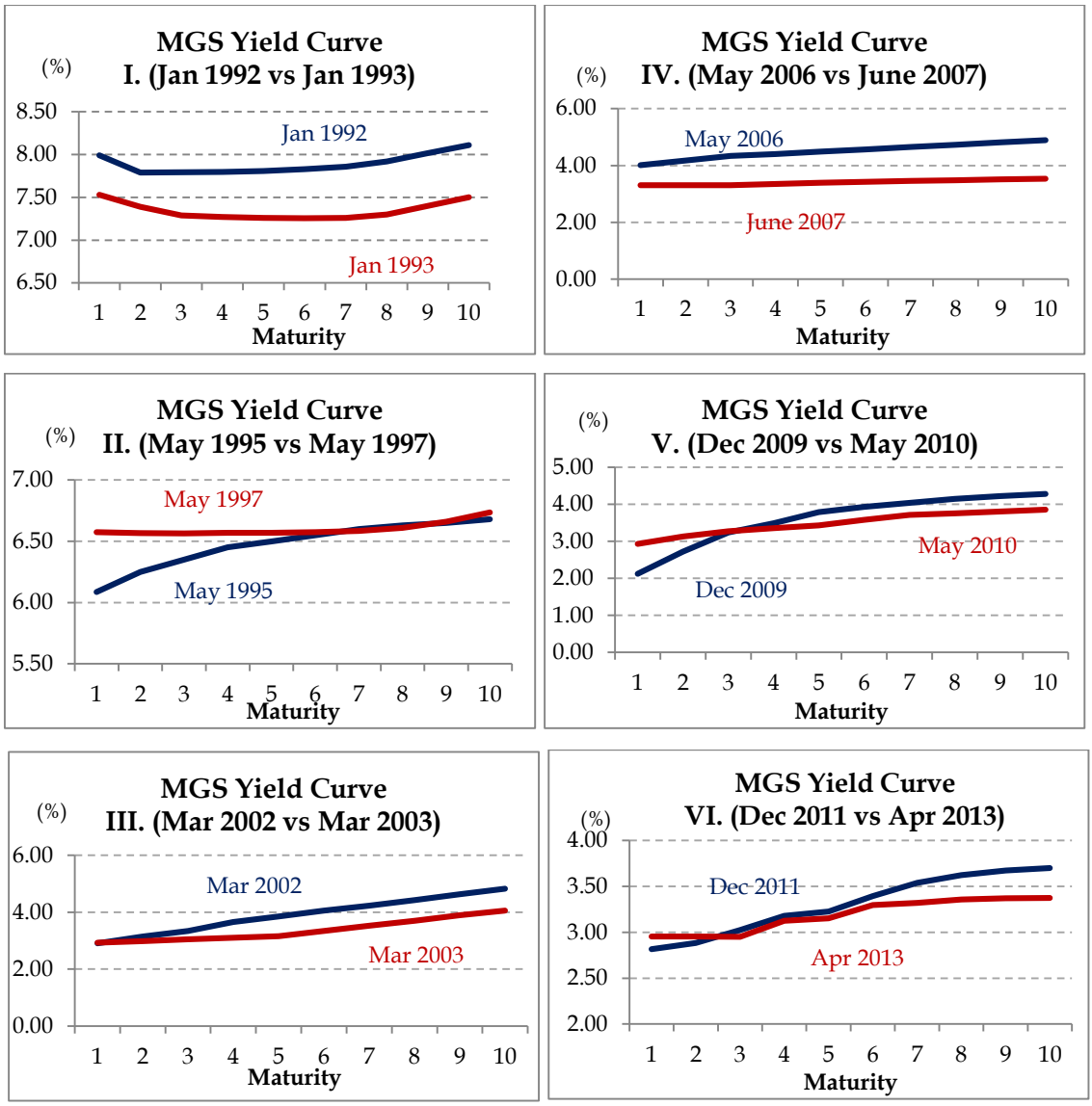


Source: BNM

[4] Argentina, Brazil, Canada, Chile, PR China, Egypt, Hungary, Japan, Greece, Mexico, Portugal, Queensland, Russia, Sweden, Turkey and Uruguay

[5] Panel dataset of 17 OECD countries

Figure 3.2: Periods of Flattening MGS Yield Curve



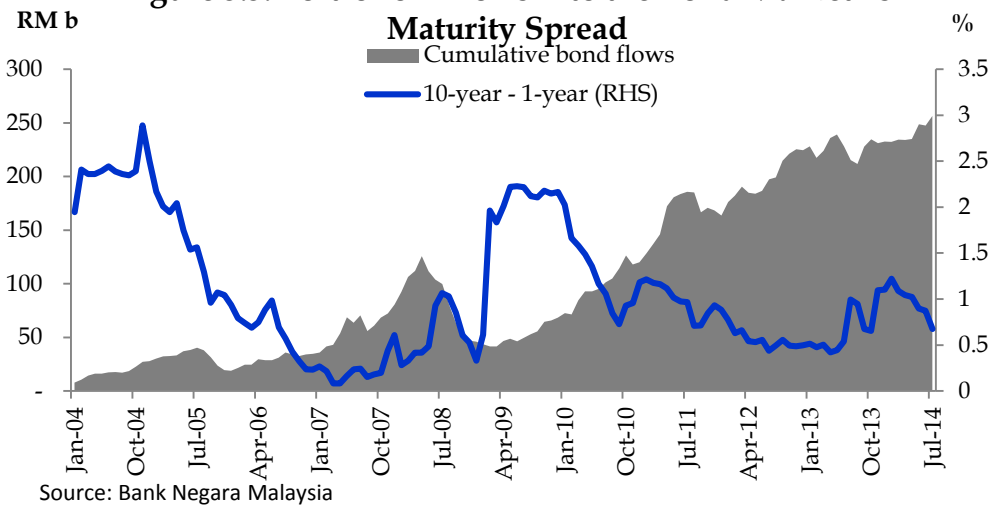
In the 1990s to early 2000s, periods where the MGS yield curve flattened were largely driven by domestic factors. Specifically, there were three distinct periods of yield curve flattening: (i) Between 1992 and 1993; (ii) Between 1995 and 1997; and (iii) Between 2000 and 2003[6]. In the first two periods, the tightening stance of BNM's monetary policy resulted in a more marked increase in the short to medium-end of the yield curve compared to the longer-end, thereby lessening the steepness of the yield curve. In the third episode (between 2000 and 2003), there was a shift in investors' preference towards fixed income investments, particularly long-term MGS, which subsequently resulted in declining long-term yields.

[6] During this period, the yield spread spikes momentarily, before resuming its narrowing trend

Since the early 2000s, the phenomenon of flattening yield curve in the ringgit bond market has been largely driven by a surge of portfolio inflows into the ringgit bond market [Figure 3.3]. Broadly, portfolio flows have contributed to the flattening of the yield curve through two channels. The first is the indirect channel, which normally occurs in the early phase of a portfolio surge. Initially, foreign investors entering the MGS market invest in the short to medium-term securities. The concentration of foreign funds in securities of short to medium tenures (e.g. 1 to 5-year) subsequently triggers several domestic institutional investors to shift their preference towards longer-tenured securities, which are viewed to be less expensive[7]. Due to the lower level of liquidity in the longer-end of the yield curve, a small increase in demand in longer-term securities often leads to marked decline in yields.

The indirect channel tends to occur within the first few months of a portfolio surge. Over time, as the stream of portfolio flows become more sustained, it contributes to the flattening of the yield curve through a more direct channel. As the prices of short to medium-term securities become more expensive, the demand for MGS eventually becomes more broad-based, with stronger demand for longer-term securities by non-residents. Similarly, the relatively lower level of liquidity in the longer-end of the yield curve magnifies the decline in longer-term yields [Figure 3.4].

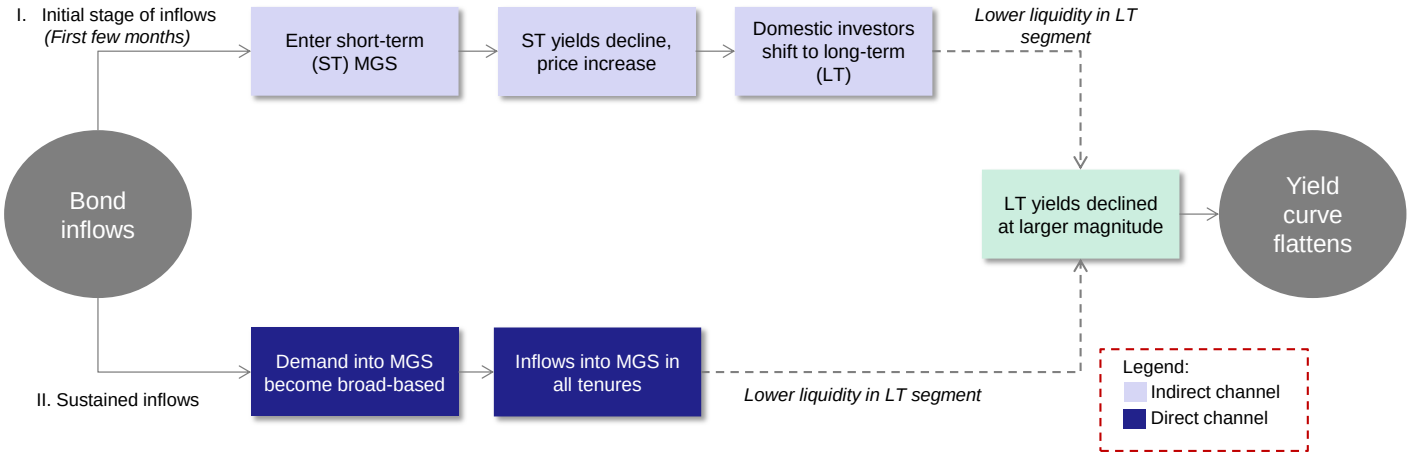
Figure 3.3: Portfolio Inflows into the Bond Market vs Maturity Spread



Source: Bank Negara Malaysia

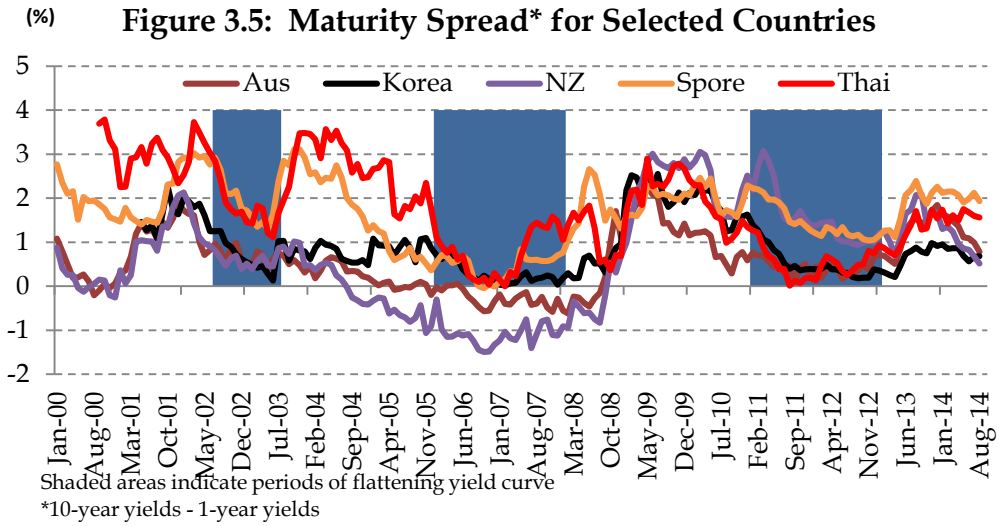
[7] Bond prices and their prevailing yields have an inverse relationship

Figure 3.4: Channels of Inflows into the MGS Market



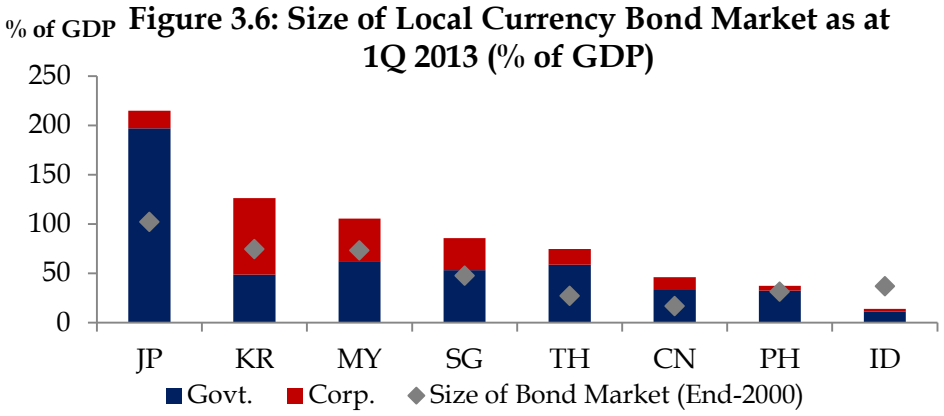
To date, there are three observable periods that reflect this development: (i) In the first half of 2007; (ii) In the first half of 2010; and (iii) Gradually in 2012 through to the first half of 2013. During the first half of 2007, portfolio flows were channelled into all tenures, pushing the entire yield curve below the Overnight Policy Rate (OPR). In line with expectations, the impact of the portfolio flows was more pronounced on the longer-end of the yield curve, thus leading to a flattening yield curve. Similarly, the levelling of the yields curve in 2010 and 2011 was due to a marked increase in demand from foreign investors for longer-term securities. The flattening of the yield curve during these two periods was also affected, in part, by increases in short-term yields following normalisation of the Overnight Policy Rate (OPR).

Malaysia's experience with episodes of flattening yield curve has also been observed in other countries, in both the developed and emerging markets. For example, in the US in 1961, the Federal Reserve (Fed) announced Operation Twist in 1961, which involved planned action by the Fed to flatten the yield curve. This was intended to lower longer-term yields to stimulate investment, while concurrently raising short-term yields to attract foreign capital and strengthen the US dollar (Rampell, 2009). More recently, this phenomenon has been more prevalent in other emerging markets with relatively developed bond markets, such as Korea, Thailand, Australia, New Zealand and Singapore which has seen its yield curve flattening in 2007 and 2010 as a result of higher entry of portfolio inflows [Figure 3.5].



A. Flattening of the Yield Curve in Malaysia Post-Liberalisation: Portfolio Flows and Other Factors

Portfolio flows into the domestic market in the 2000s were largely influenced by two key developments in the Malaysian capital markets. Firstly, large-scale efforts were undertaken by BNM and other regulatory authorities to develop the ringgit bond market, resulting in the domestic bond market emerging as one of the biggest and most advanced in the region [Figure 3.6]. Secondly, the Malaysian financial system embarked on greater liberalisation and deregulation culminating in a series of successive measures in early 2000s, creating a more accessible and integrated financial market in Malaysia. The confluence of these two developments has since led to a rising trend in portfolio inflows into the ringgit bond market, and, concurrently, an increase in the holdings of ringgit debt securities by foreign investors.



Source: Asian Development Bank AsianBonds Online

In addition to the liberalisation and development of the domestic bond market, another key factor that contributed towards attracting flows into the domestic bond market was the expectation among foreign investors for ringgit appreciation. Periods of large inflows into the domestic bond market occurred simultaneously with a build-up in investors' expectation for a sustained strengthening of the ringgit. In addition, the stream of inflows during these periods was partly triggered by investors' ongoing search for yields due to the high liquidity and low interest rate environment in the advanced economies as well as for portfolio diversification. After the collapse of Lehman Brothers in 2008, the search for yields was further compounded by additional injections of global liquidity brought about by unconventional monetary measures implemented in the major advanced economies. Furthermore, with interest rates in major advanced economies at historical lows, this added further impetus for foreign investors to enter the domestic bond market. In 2011, the onset of the sovereign debt crisis in Europe led to increased interest among investors for emerging market bonds, including ringgit denominated bonds, further contributing to the decline in long-term yields. Additionally, the gradual implementation of Basel III beginning in 2013 required financial institutions to hold and demand more safe assets, which naturally comprised mainly of government bonds (Iorgova, et al., 2012), in turn placing further downward pressures on the longer-term yields.

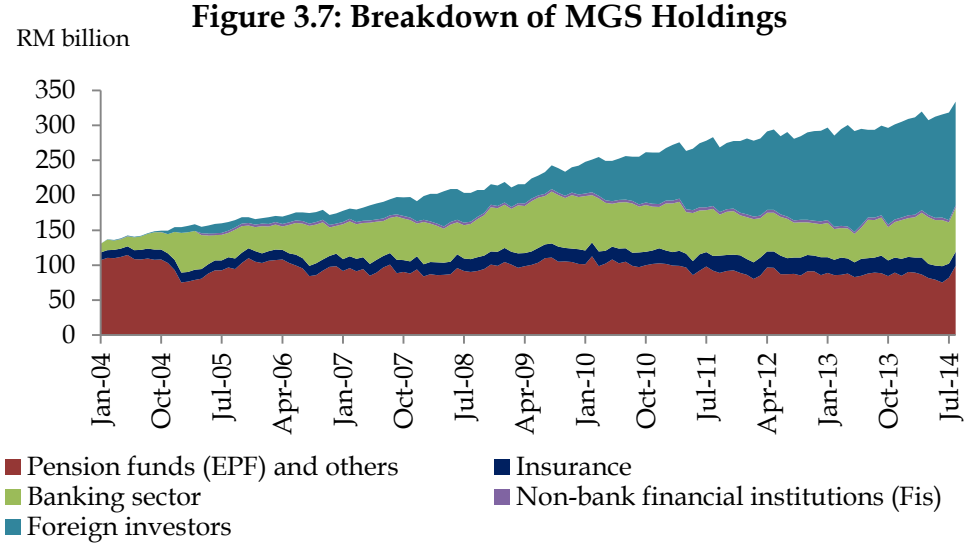
The impact of foreign funds on the yield curve was also compounded by several structural issues in the domestic bond market. Despite the rapid growth of the ringgit bond market following large-scale efforts undertaken by BNM, several structural issues in the domestic bond market, at times, led to large magnitudes of inflows to be absorbed quickly by the market. While the private debt securities (PDS) or corporate bond market remains on a gradual expansion path, the Malaysian bond market is still very much a sovereign market and the MGS remains to date, the largest supply of investible bonds in the country. Occasionally, there were significant demand for quasi-government issuances (such as Khazanah bonds as well as those that carry government guarantees), which potentially attracted foreign funds, but the amount of available securities remained small to accommodate a marked and rapid surge of inflows. The limited supply of investible bonds were also exacerbated by the relatively smaller issuances of MGS with maturities exceeding 10 years compared to short and medium-tenured securities[8]. Consequently, this structural mismatch between demand and

[8] Efforts to widen the maturity of government securities in Asia in general, have been hampered by a prominent presence of banks which for liquidity management purposes would typically prefer shorter to medium term instruments over longer-term instruments (Goswami and Sharma, 2011)

supply of ringgit-denominated bonds contributed to the compression of longer-end yields in Malaysia, particularly during periods of large surge of portfolio inflows.

In addition to the limited supply of investible bonds, the large presence of domestic institutional investors such as provident and insurance funds also magnified the impact of yield compression during periods of heavy inflows [Figure 3.7]. Firstly, these institutional investors normally adopted a buy-and-hold strategy, which tended to result in a more captive market that could lower the liquidity in the domestic bond market. Consequently, any marked surge of funds in the bond market (such as those coming from portfolio inflows) magnified its impact on yields. Given that these institutional investors were also large holders of MGS and other highly rated securities[9], this further widened the mismatch between the market's demand and supply, especially during periods of large capital inflows.

Figure 3.7: Breakdown of MGS Holdings



Source: Bank Negara Malaysia

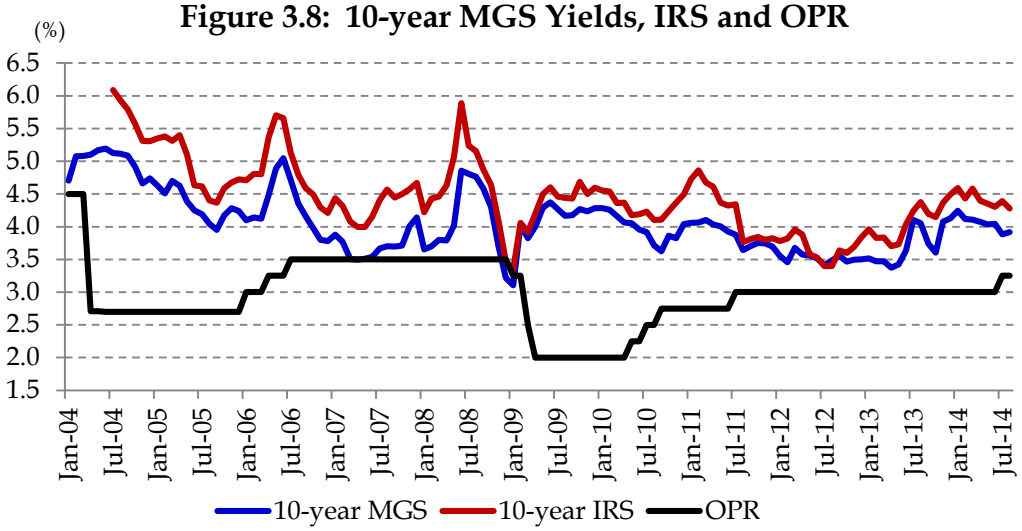
B. Potential Implications Arising from the Flattening Yield Curve and Rising Foreign Participation in the Ringgit Bond Market

One possible effect of the flattening of the yield curve is the reduced transmission of monetary policy to the longer-end of the yield curve. The outcome of this would lead to an inadequate reflection of the monetary stance in financial prices, particularly for financial

[9] While asset allocations of pension and provident funds are decided by its respective investment panel, given that these institutions are large holders of liabilities (individuals' contributions) there is still a need for them to apportion a certain amount of their investment portfolio on safer assets such as government securities and higher-rated or government-guaranteed private debt securities.

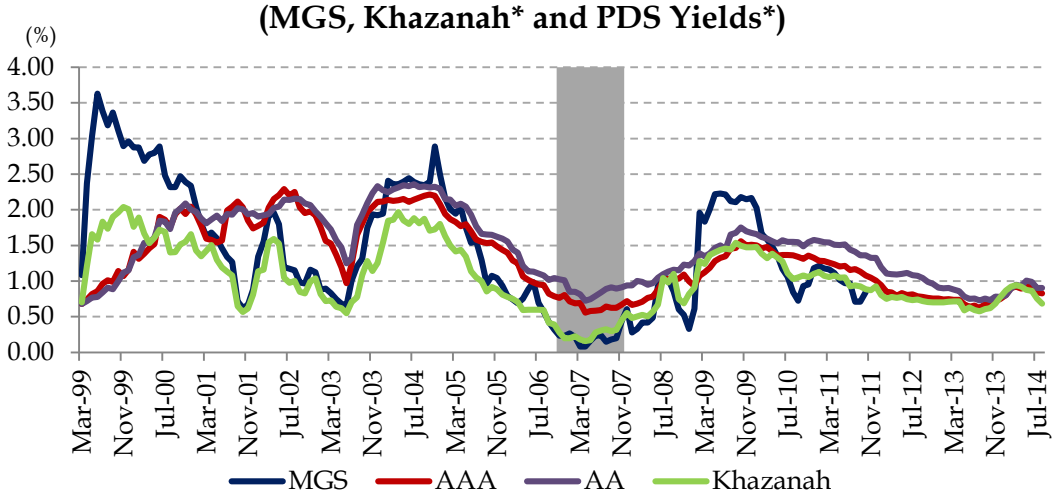
instruments whose rates are priced off from sovereign yields. Felman, et al. (2011) highlighted that, to the extent that yield curves are driven by external developments, there is a risk that monetary independence would be reduced. Evidence of this effect was seen in the downward trend of the interest rate swaps[10] (IRS) [Figure 3.8], even as the OPR was tightened, particularly in 2011. Similarly, in 2007, PDS yields for higher rated bonds[11] mirrored the flattening movement of the MGS yields, evidenced by its narrowing maturity spread, despite the unchanged stance in monetary policy [Figure 3.9].

Figure 3.8: 10-year MGS Yields, IRS and OPR



Source: Bank Negara Malaysia

Figure 3.9: Maturity Spread (MGS, Khazanah* and PDS Yields*)

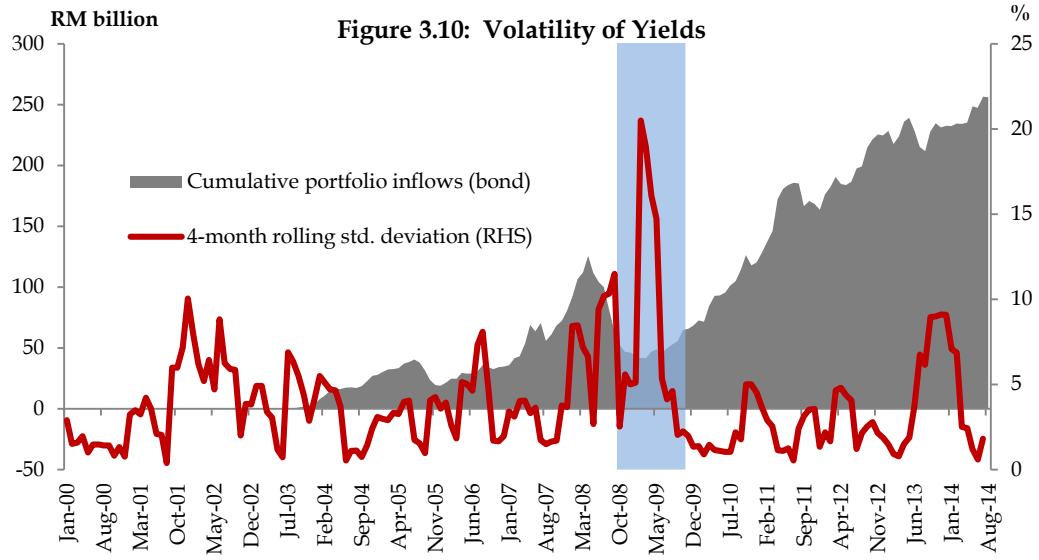


* For Khazanah and PDS yields, maturity spread is calculated as 10-year yields less 3-year yields
Source: Bank Negara Malaysia

[10] The IRS is one of the determinant of pricing for is hire purchase rates.
[11] Khazanah bonds, AAA and AA rated PDS

Higher portfolio inflows also increased the level of volatility in the domestic bond market. Given the potentially speculative nature of portfolio flows, which are more sensitive to abrupt changes in sentiments, this contributed to a situation where the level of yields could change significantly within a short period of time. While the trend in volatility had generally been rising post-foreign exchange liberalisation, it was observed that volatility in yields reached its highest level during times where there was a large reversal of portfolio flows in the domestic bond market [Figure 3.10][12]. Given the prevailing global economic conditions of a prolonged period of low interest rates coupled with high levels of uncertainty, any swing in investors' perception of risks potentially led to an escalation of short-term spikes in volatility (Iorgova, et al., 2012). Peiris (2010) postulated that increased foreign participation in local currency bond markets led to greater yield volatility, especially during periods of sudden withdrawals. Felman, et al. (2011) also concurred with the view of a potential risk of rising volatility as portfolio inflows into the bond market increased, as evidenced from the collapse of Lehman Brothers in 2008.

Figure 3.10: Volatility of Yields



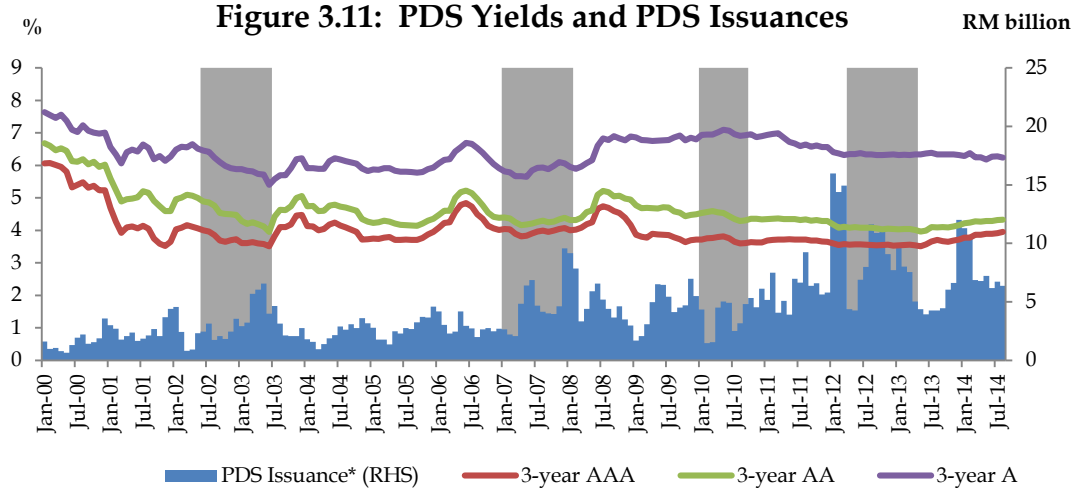
Source: Bank Negara Malaysia, author's calculation

Where financing is concerned, there was a dual impact of the rising portfolio flows into the bond market. During periods where large portfolio inflows compressed long-term yields downwards, this created an incentive for firms to raise financing through issuances of debt

[12] One interesting point to note is that the yield volatility was much higher during the global financial crisis (GFC) in 2008 relative to the 'taper tantrum' episode in the second half of 2013. Two possible explanations could be postulated; firstly, the size of outflows relative to the peak size of cumulative inflows was larger during the GFC period. Secondly, long-term institutional investors could have also sold MGS during the same period.

securities given the downward trend of borrowing costs. This was partially reflected in 2007, when there was a marked increase in PDS issuances when long-term PDS yields were on a downward trend [Figure 3.11]. Conversely, during periods where there was a noticeable reversal of portfolio flows and the overall volatility in the market was elevated, this brought about difficulty for firms that required financing, as borrowing costs would be at an elevated level (Peiris, 2010). While regulations in Malaysia's PDS market provided flexibility for firms to plan for their issuances[13], nonetheless, the swift entry and exit of portfolio flows into the ringgit bond market and its impact on yields presented an additional layer of challenge for prospective PDS issuers.

Figure 3.11: PDS Yields and PDS Issuances



Source: Bank Negara Malaysia
Shaded areas indicate periods of yield curve flattening
* PDS issuances data is calculated on a 3-month moving average

IV. Empirical Estimation

The preceding discussions provided indications that the rising presence of foreign investors in the ringgit bond market exerted a strong influence on the decline in long-term yields, subsequently causing the yield curve to flatten. This section attempts to provide an empirical evaluation of the impact of foreign investors' involvement in the ringgit bond market on longer-term MGS yields.

There are several studies that attempt to quantify the direct relationship between foreign portfolio inflows or foreign investors' participation and local currency bond yields, both in

[13] PDS issuers in Malaysia have at least six months of grace period to conduct their first issuance, upon receiving approval from the Securities Commission (SC)

the developed and emerging markets. Warnock and Warnock (2009) studied the factors contributing to the decline in longer-term yields in the US in the 1990s, and identified that, apart from inflation expectations and volatility, foreign inflows into the US bond market was also statistically significant in lowering the 10-year US Treasury yields. In their estimation using data from 1984 to 2005, 12-month inflows of 1% of GDP was associated with a 19-basis point reduction in 10-year Treasury yields. Balakrishnan, et al. (2011) studied the role of non-resident investments in explaining asset price or interest rate movements in emerging market economies. Using a fixed effect panel data estimation for eight countries[14], their results showed that, on average, each percentage point increase in non-resident participation reduced long-term bond yields by about 5 basis points. Peiris (2010) also performed a similar estimation, and the results were consistent with those of Balakrishnan, et al.(2011). Additionally, using the GARCH[15] approach, Peiris (2010) also estimated the impact of foreign participation in government bond markets on the volatility of longer-term bond yields in the emerging markets, and found that greater foreign participation did not necessarily result in increased volatility in bond yields and, in fact, could even dampen volatility in some instances. Marcilly (2009) used country specific VAR[16] method to determine the causality between foreign inflows and the local currency of 10-year government bond yields in Indonesia, India, Malaysia and Thailand. The results from the study showed that causality runs mainly from the 10-year yields to the stock of foreign investments in Indonesia and Malaysia. The results also showed that given a shock of 1% in foreign investments, the impact on yields would occur two months after the shock, but were nonetheless statistically insignificant.

Our estimation focused on determining quantitatively the impact foreign investors' participation in Malaysia on longer-term MGS yields. For this analysis, our dependent variable was the 10-year and the 1-year MGS yields. For completeness and to specifically determine the impact of foreign participation on the flattening of the yield curve, we also performed the estimation on the 10-year maturity spread[17].

[14] Brazil, Indonesia, Korea, Malaysia, Mexico, Poland, Thailand and Turkey
[15] Generalised Autoregressive Conditional Heteroskedasticity
[16] Vector Autoregression
[17] The results for estimation on the maturity spread were not discussed as they are statistically insignificant and were not robust. Nevertheless, readers are welcomed to contact the authors for detailed results of the estimation

Two types of variables were considered to represent foreign investors' involvement in the ringgit bond market. The first one was foreign investors' holdings of ringgit bonds as a percentage of total outstanding bonds. The second possible variable that could be used to reflect foreign participation in the financial market was the non-resident flows on the bond market. As holdings data are stock data, using flows data possibly would allow us to capture the dynamic behaviour of portfolio inflows and its impact on yields.

In an attempt to capture the impact of foreign investors' participation, non-resident holdings data was used. The data on holdings was available on a quarterly basis from 1996, encompassing pre and post-foreign exchange liberalisation period[18]. In addition, we also performed estimations on portfolio flows by taking the change in non-resident holdings to see if there are any differences in its impact on MGS yields.

A. Estimation using non-residents' holdings of MGS data

For our estimation, we adopted the empirical model used in Warnock and Warnock's (2009) study on the relationship between international capital flows and US interest rates, and Peiris' (2010) estimation of foreign participation on local currency bond yields in emerging markets. The model was, however, modified slightly in view of data availability, as well as to incorporate some control variables that are more specific to MGS yields. Our model is written as the following:

$$r_t^{LT} = \alpha + \beta_1 r_t^{ST} + \beta_2 \pi_t + \beta_3 l_t + \beta_4 g_t + \beta_5 x_t + \beta_6 v_t + \beta_7 f_t \quad (1)$$

where r_t^{LT} denotes the dependent variable, either the nominal 10-year or 1-year MGS yields, r_t^{ST} is the nominal 3-month Malaysian Treasury bills (MTB) yields[19] (controlling for impact of monetary policy), π_t is rate of inflation (controlling for inflation expectations), l_t is the

[18] McCauley (2008) cautioned on the use of holdings data as a proxy for foreign investors' participation. Firstly, biasness issues exist with using foreign holdings data as some domestic agents held local currency securities on behalf of foreign agents. Additionally, a number of foreign investors may avoid investing directly in the local bond market by entering the derivatives market instead.

[19] 3-months Treasury bill rate is used as a proxy to control for the impact of monetary policy because it tracks the Overnight Policy Rate (OPR) closely, with more variability. The model was also run using OPR and the result was similar.

turnover ratio[20] of the bond market (controlling for market's liquidity), g_t is a measure of the government's sovereign risks, in this case, the fiscal deficit as a percentage to GDP, x_t denotes the annual GDP growth, v_t is the MOVE index[21] (controlling for volatility), and finally, f_t is foreign investors' holdings of MGS as a percentage of total MGS outstanding.

From model (1), we expected the nominal 3-month MTB yields, inflation, sovereign risks, economic growth, and the MOVE index to have a positive relationship with the dependent variable. Turnover ratio and foreign investors' holdings of MGS were expected to show a negative association with the dependent variable. We also postulated that a larger foreign investors' holdings coefficient on the estimation with the 10-year MGS yields, as the dependent variable relative to the 1-year MGS yields, would support our conjecture that the presence of foreign investors do contribute to the incidence of flattening yield curve.

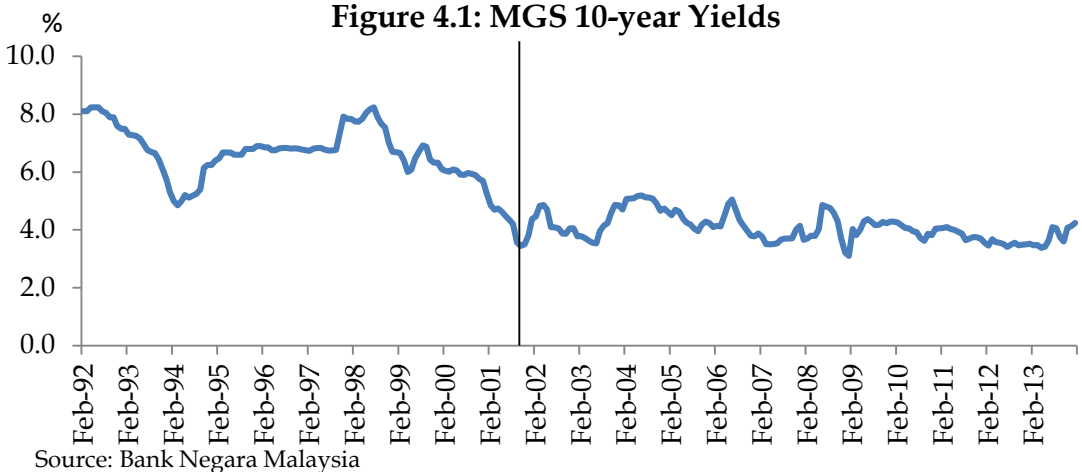
We ran our initial estimation using the full sample of quarterly data since 1996 on the three dependent variables – MGS 10-year and 1-year yields, as well as the 10-year maturity spread. The estimation results showed that foreign investors' holding of MGS is statistically significant in determining the level of both the 10-year and 1-year MGS yields. We also observed a larger coefficient for the estimation on the 10-year yields. In addition to foreign investors' holdings, the liquidity conditions, as represented by the turnover ratio and the 3-month MTB yields were also important determinants of the MGS yields. Additionally, the inflation variable played a role in determining the MGS 1-year yields, implying that inflation expectations affected investors' sentiments in the short-term

The results, however, did not appear to be statistically robust and diagnostic checks highlighted the presence of instabilities in the model. From the plot of the 10-year MGS yields, it appeared at first glance that there was a structural break at the end of 2001 [Figure 4.1], consistent with the time when BNM and Securities Commission (SC) took aggressive efforts to develop and deepen the domestic capital markets. Statistical analysis also confirmed the presence of a structural break in the data. As such, we re-estimated our model using the sample period beginning in 2002. To take into account the liberalisation measures

[20] Turnover ratio = MGS turnover / Total outstanding bonds
[21] The Merrill Option Volatility Expectations Index (MOVE©) reflects market estimate of future Treasury bond yields volatility

undertaken by BNM in 2004, as well as to ensure econometric robustness, we also re-estimated for the sample period of 2004-2013.

Figure 4.1: MGS 10-year Yields



Source: Bank Negara Malaysia

Estimation using the sample data beginning in 2002 and 2004 yielded similar results relative to the estimation using the full sample size [Table 4.1]. Foreign investors' participation in the MGS market, based on the foreign holding of MGS, was statistically significant in determining the level of both the 10-year and 1-year MGS yields. Furthermore, similar to earlier estimation, the coefficient on the 10-year MGS yields estimation was larger than the 1-year MGS yields. A one percentage point increase in foreign investors' holdings of ringgit bonds (as a percentage of total outstanding bonds) was associated with a 1 basis points decline in the 10-year MGS yields, and a 0.4 basis points decline in the 1-year MGS yields. Consistent with the estimation utilising a longer sample period (1996), liquidity conditions and the short-term MTB yields also had a statistically significant relationship with MGS yields, while inflation had a statistically significant association with the 1-year MGS yields.

The results from our estimation are in line with the findings of studies by Balakrishnan, et al. (2011) and Peiris (2010). Interestingly, in all the estimations that were done, the coefficient for the liquidity conditions in the bond market was markedly larger than other statistically significant variables, including foreign holdings of MGS. Furthermore, comparing the liquidity coefficient between the estimations on the 10-year and 1-year MGS yields, the coefficient on the long-term yields was also larger than on the 1-year MGS yields. The results, to some extent, reinforced the theoretical channels of transmission that were

presented earlier, that liquidity conditions, specifically lower liquidity conditions, magnified the impact of foreign investors' involvement in the MGS market.

It was also observed from the estimations on the 10-year MGS yields that the coefficient for the 3-month MTB yields had a negative sign, implying that, on average, the short-term rates moved in opposite directions with the long-term MGS yields. This suggested that the policy rate may not be effective in influencing longer-term rates, especially at times of high portfolio inflows. Further discussion on this issue is outlined in the following section. Nevertheless, further investigation needs to be done on the monetary policy transmission in Malaysia to understand the relationship between short-term and longer-term rates.

We should note at this point, however, that while the estimation results of a 1 percentage point increase in foreign holdings of MGS leading to a 1 basis point decline in the 10-year MGS yields was *statistically significant*, it is not necessarily *economically significant*. We have to, however, point out that the small coefficient of the foreign holdings could potentially be attributed to the downward bias that is present in the model arising from the endogeneity of the independent variables, as highlighted by Beltran et. al (2013). Nonetheless, while a 1 basis point increase in MGS yields may not seem to be large given the variations in the 10-year MGS yields between 2004 and 2013, the impact could be amplified by the liquidity conditions in the MGS market. This could eventually entail some economic impact.

We also augmented our estimations in two added dimensions. Firstly, we replaced the holdings data with net foreign flows data, by taking the change in non-resident holdings, to see if there are any differences in its impact on MGS yields. Secondly, in recent times, a large portion of the discussion surrounding portfolio flows among policy makers in the emerging market economies have been centered on analysing the impact of a portfolio outflows or reversal on financial markets. The discussion also includes government bond yields, whereby the impact of outflows is generally assumed to be asymmetric relative to inflows. With this in mind, we performed a separate estimation in which we included both a slope and intercept dummy variable to represent periods when there are portfolio outflows from the MGS market.

While our estimation using foreign flows data from 2002 yielded the correct sign, the flows data, nonetheless, did not have a statistically significant association with both the MGS 10-year and 1-year yields. A possible explanation could be the use of quarterly data instead of

a higher frequency data, which may have masked or watered down the dynamic behavior of foreign flows and its subsequent impact on MGS yields. Turning to the results of our estimation that incorporated the dummy variables for foreign outflows (column (5) and (6)), both the slope and coefficient dummy variables had a statistically insignificant relationship with MGS yields. This could possibly be due to limited historical data on periods of outflows to date[22]. Going forward, it is hoped that with more data and observed periods of outflows, the results would provide deeper insights on the different dynamics and impact that outflows may have on MGS yields.

Table 4.1: Summary Regression Results
Estimation period: 2002Q1- 2014Q1

	MGS10Y (1)	MGS1Y (2)	MGS10Y (3)	MGS1Y (4)	MGS10Y (5)	MGS1Y (6)
C	5.952***	0.516***	6.016***	0.564***	6.046***	0.582***
Control Variable						
Short-term yields	-0.563***	0.904***	-0.638***	0.862***	-0.572***	0.899***
Inflation	0.063	0.036***	0.050	0.027	0.068	0.036**
Liquidity ratio	-1.698***	-0.208	-1.952***	-0.344	-1.814***	-0.282
GDP	0.066***	0.012	0.0784***	0.019	0.064***	0.012
MOVE	0.001	-0.0001	0.002	-0.0002	0.002	-0.001
Fiscal deficit /GDP	0.032**	0.009*	0.035**	0.01**	0.032**	0.008*
Dummy					-0.160	-0.080
Dummy*Foreign hdgs.					0.003	0.004
Foreign participation variable						
Foreign holdings	-0.008**	-0.004***			-0.009**	-0.005
Net flows			~-0	~-0		
Sample size	49	49	49	49	49	49
Adjusted R-squared	0.510	0.917	0.56	0.900	0.498	0.918

Note: ***, ** and * denote statistical significance at the 1, 5 and 10 per cent level.

For robustness and completeness purposes, we also performed the estimation using higher frequency monthly data. Results using the monthly data also showed that foreign holdings are statistically significant in affecting the level of MGS yields. Moreover, estimation using higher frequency monthly data, using monthly net foreign flows figures, also indicated that it is statistically significant in determining the MGS yields. As expected, the coefficient for the

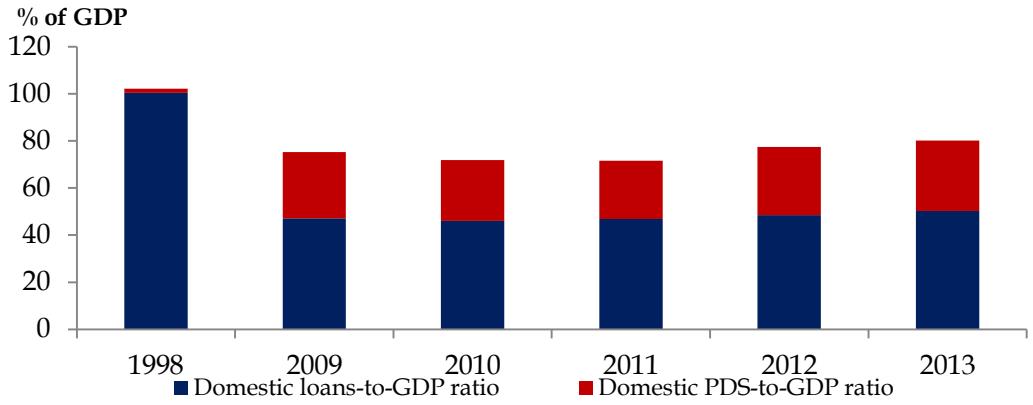
[22] Since 2002, only two observable periods of large and sustained outflows have been recorded; during the global financial crisis in 2008 and the recent 'taper tantrum' episode in May 2013

liquidity conditions variable was the largest for the estimations, particularly on the 10-year MGS yields [See Appendix 2].

V. Policy Implications

On the surface, the flattening of the yield curve amidst strong portfolio inflows appears to have affected the monetary transmission to the economy. However, despite the marked decline in longer-term yields during periods of yield curve flattening, higher portfolio inflows did not fully nullify BNM's ability to influence the economy. Unlike in the US and other economies, where the bulk of financing was sourced from the capital market, financing in Malaysia still relied heavily on bank lending [Figure 5.1]. Retail lending rates in Malaysia were mainly influenced by banks' funding costs – that is, money market rates – which had a higher degree of pass-through to the lending rates (Abdul Majid, 2010). One exception was the decline in hire purchase rates, which were derived from IRS. However, it should be noted that these rates had also been suppressed by the intense competition among banks especially in the car loan market. Balakrishnan, et al. (2011) showed that, based on their estimation, the higher presence of foreign investors did not curtail the effectiveness of the policy rates altogether, as their results showed that more than half of a 25-basis point increase in policy rates was transmitted across the yield curve into longer-term rates.

Figure 5.1: Financing by Non-Bank Business Sector



Source: Bank Negara Malaysia Financial Stability and Payment System Report 2013

There could be significant impact of portfolio reversals on the domestic financial markets, particularly on the level of volatility and its consequential impact to the economy. Due to limited historical data on periods of portfolio outflows, the impact of portfolio outflows

remains an ongoing challenge to quantify. It can be postulated, nonetheless, that while the impact of portfolio outflows on sovereign yields would be larger compared to the impact of portfolio inflows amidst increased risks aversion during periods of outflows, the magnitude of the impact would also depend largely on the triggering factors for the outflows in the first place. Nevertheless, at present, there is an adequate demand for ringgit-denominated bonds, particularly from domestic institutional investors to absorb any aggressive sell-off activities from foreign investors during periods of marked reversal. Based on a GARCH analysis, Peiris (2010) estimated that in Malaysia, yield volatility generated from greater foreign participation was partly alleviated by the presence of large domestic institutional investors. Additionally, these periods of reversal had been temporary and the yield curve eventually normalised as negative sentiments in the ringgit bond market improved. Prasad and Rajan (2008) further argued that over the long run, the relationship between yields volatility and foreign participation may be much weaker. They postulated that to the extent that the increase in foreign investors drove up market liquidity and continued to demand strong corporate governance and improved transparency, it would have a mitigating impact on price volatility in the long-run.

With regard to capital flow management measures (CFM), Malaysia has not employed any CFMs since the Asian Financial Crisis. Realising that these inflows can have undesirable impact, including exchange rate overshooting and inflating asset price bubbles, many emerging economies, including regional countries, have deployed various CFMs to mitigate these spillover effects. Nevertheless, market participants remain wary of such possibility in light of this recent trend. The utilisation of capital flow management measures (CFM) has not been completely ruled out by policy makers, if warranted by economic conditions.

Going forward, efforts to further deepen the ringgit bond market will remain a priority, firstly to improve the liquidity conditions in the domestic bond market and improving the breadth of the market. This includes increasing the number of investible securities, which is essential in absorbing large streams of portfolio inflows. While steps have been taken to widen the maturity of MGS[23], more attention should also be given towards deepening the PDS market going forward. Gyntelberg, Ma and Remolona (2005) argued that while, in the past, authorities in Asia had emphasised on expanding the corporate bond market despite the

[23] Based on MGS Auction Calendar, see https://fast.bnm.gov.my/fastweb/public/MainPage.do

issuances being heavily concentrated on quasi-government issuers or those with government guarantees, this might have been done at the expense of improving transparency and the timeliness of information in the corporate bond market. Expanding the corporate bond market beyond high-rated and government guaranteed securities would spread out the current heavy concentration on MGS yields. Effective March 2015, the inclusion of the Government Investment Issues (GII)[24] into the Barclays Global Aggregate Index will increase the demand for GIIs and could ease the heavy concentration of foreign funds in the MGS market. BNM, together with other institutions such as the Securities Commission (SC), will continue to play an active role in developing the ringgit bond market into a vibrant bond market in the region. Strong infrastructure and regulatory frameworks have been put in place together with various initiatives to promote the further growth of the bond market. Malaysia also participates in regional economic and financial initiatives, such as the Asian Bond Market Initiative and the Asian Bond Funds[25], aimed at broadening and deepening the domestic and regional bond markets.

VI. Concluding Remarks

Since 2002, episodes of flattening of the MGS yield curve have been dominated by the surges in portfolio inflows entering the domestic bond market.

We have studied Malaysia's experience with flattening of yield curve, particularly when it was driven by rising portfolio inflows or the growing presence of foreign investors, as well as its implications to the economy. Our analyses suggested that since 2002, periods of flattening yield curve in Malaysia had mainly been led by an increase in portfolio inflows. The fall in longer-term yields is further augmented by some structural issues existing in the ringgit bond market, particularly liquidity conditions, which are natural in a bond market that is still growing, such as Malaysia's.

[24] GIIs are debt securities issued by the Government that are in compliance with Islamic Shariah requirements and are an alternative debt instrument for the Government.
[25] For further information see http://asianbondsonline.adb.org/regional/guides/definition.php?term=Asian+Bond+Fund+1+%28ABF1%29 and http://asianbondsonline.adb.org/publications/adb/2008/abmi_roadmap.pdf

In our estimation, we found that a higher presence of foreign investors in the domestic bond market, whether represented by foreign investors' holdings of debt securities or the level of net portfolio inflows, is *statistically significant* in contributing to the decline in longer-term yields, by 1 to 2 basis points. The relationship was consistent across different permutation of variables used.

This environment of large and sudden inflows appeared to impact the effectiveness of monetary transmission, as evident from the negative relationship estimated between short-term yields and longer-term yields. Nevertheless, the impact of monetary policy on the economy was not nullified, as financing in the economy still depended largely on bank borrowings, which were priced off the money market rates. Moving forward, however, measures to further deepen the bond market should continue to be introduced to ensure that the market will be able to absorb the demand for ringgit bonds.

In the near term, it would be useful to closely study measures that could specifically address the structural issues in the ringgit bond market. In addition, it would also be worthwhile to look into the asymmetric effect of portfolio inflows and outflows on the sovereign yields, especially at times of heightened volatility in the financial markets.

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VIII. **Appendix 1: Description of Data Sources Used in Estimation**

Variables	Unit	Source
10-year MGS yields	Percent	Bank Negara Malaysia
1-year MGS yields	Percent	Bank Negara Malaysia
3-month MTB yields	Percent	Bank Negara Malaysia
CPI (yoy growth)	Percent	Department of Statistic Malaysia
Liquidity ratio	Ratio	Bank Negara Malaysia
GDP (yoy growth)	Percent	Bank Negara Malaysia
VIX	Index	Bloomberg
MOVE	Index	Bloomberg
Fiscal deficit	Percent (of GDP)	Ministry of Finance, Malaysia
IPI (yoy growth)	Index	Department of Statistic Malaysia
Debt-to-GDP	Percent	Ministry of Finance, Malaysia
Foreign holdings	Percent (of total bonds outstanding)	Bank Negara Malaysia
Bond flows	RM billion	Bank Negara Malaysia

IX. Appendix 2: Summary Regression Results using Monthly Holdings Data

Summary Regression Results - Monthly
Estimation period: 2002M1- 2014M6

	MGS10Y (1)	MGS1Y (2)	MGS10Y (3)	MGS1Y (4)	MGS10Y (5)	MGS1Y (6)
C	1.241***	0.375***	1.230***	0.298***	1.271***	0.387***
Control Variable						
Lagged dependent var	0.793***	0.437***	0.808***	0.573***	0.796***	0.434***
Short-term yields	-0.094*	0.514***	-0.102***	0.374***	-0.099**	0.517***
Inflation	0.012	0.025***	0.005	0.016**	0.008	0.026***
Liquidity ratio	-1.117***	-0.104	-1.181***	-0.271	-1.187***	-0.115
Growth	0.002	0.001	0.002	0.002*	0.002	0.0004
Volatility	~0	-0.001***	~0	-0.001***	~0	-0.001***
Sovereign risks	0.002	0.001	0.002	0.001	0.002	0.001
Dummy					0.034	-0.027
Dummy*Foreign hdgs					0.002	0.001
Foreign participation variable						
Foreign holdings	-0.002	-0.004***			-0.002	-0.004
Net flows			-0.002***	-0.006*		
Sample size	150	150	150	150	150	150
Adjusted R-squared	0.820	0.949	0.832	0.939	0.824	0.949