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Nonresident Capital Flows and Volatility:
Evidence from Malaysia's Local Currency Bond Market

by David A. Grigorian

I N T E R N A T I O N A L M O N E T A R Y F U N D

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Asia and Pacific Department

**Nonresident Capital Flows and Volatility:
Evidence from Malaysia's Local Currency Bond Market**

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Abstract

Malaysia's local currency debt market is one of the most liquid public debt markets in the world. In recent years, the growing share of nonresident holders of debt has been a source of concern for policymakers as a reason behind exchange rate volatility. The paper provides an overview of the recent developments in the conventional debt market. It builds an empirical two-stage model to estimate the main drivers of debt capital flows to Malaysia. Finally, it uses a GARCH model to test the hypothesis that nonresident flows are behind the observed exchange rate volatility. The results suggest that the public debt market in Malaysia responds adequately to both pull and push factors and find no firm evidence that nonresident flows cause volatility in the onshore foreign exchange market.

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I. Background and Motivation

Well-functioning local currency public debt markets generally provide more stable budget financing and contribute to financial deepening and economic development. They are also an important venue for wealth accumulation for residents, providing an opportunity for financial returns free of foreign exchange rate risk. However, debt markets do not develop in a vacuum. Factors that drive their development include proper legal foundations, robust fiscal and structural policies, and monetary policy that provides for well-anchored inflationary expectations and more freely floating exchange rates to help attract foreign investors.

Foreign (i.e., nonresident) investment has played a key role in developing debt markets in emerging and developing economies around the world. By generating a more diversified investor base and stronger overall demand for sovereign securities, foreign investment typically results in lower yields and deeper liquidity. In addition, the presence of nonresident investors helps reduce the direct link between domestic financial institutions and government and through that reduce their vulnerability to sovereign risk, with implications for both the asset and liability sides of the financial institutions' balance sheet (e.g., Grigorian and Manole, 2017). However, this may come at the expense of greater (price and exchange rate) volatility, resulting in a tradeoff between (lower) yields and (higher) volatility.

The direction of causality between nonresident flows and market volatility is much less clear. Assuming that information is costly, Calvo and Mendoza (1996) lay out a theoretical foundation for potentially higher volatility in nonresident holdings of sovereign debt. Using the same framework, they also show that nonresident investments in sovereign securities are negatively correlated with the variance of the yield. Thus, while nonresident flows can inherently be more volatile, they may also be deterred by the volatility of the market. This paper tests some of these relationships using data from Malaysia.

In the OECD context, Andritzky (2012) finds a statistically significant relationship between bond yields and nonresident ownership: a 1 percent increase in the share of securities held by nonresidents is associated with a 3-4 basis point drop in yields. The paper also finds a small but statistically significant relationship between foreign participation and volatility. Causality tests are somewhat ambiguous, but overall they suggest that lower yields may exert a “pull effect” on foreign investors, rather than foreign investors themselves driving down yields.²

Arslanalp and Tsuda (2014) study the composition of, and the demand for, the emerging market local currency government securities. They show that foreign flows to emerging markets (EMs) were relatively modest before the global financial crisis (GFC). Foreign flows to EMs became much more differentiated during the GFC (relative to the pre-crisis period), as investors became more sensitive to risks. After the GFC, EMs saw large across-the board

² This result is explained in the paper by the role that strong macroeconomic fundamentals (that are typically associated with lower spreads) may play in attracting foreign investors.

foreign inflows driven by monetary accommodation in advanced economies and improved growth outlook for EMs.

Similar research by Koepke (2015) stresses the importance of understanding the role of structural (i.e., non-cyclical) forces—such as, the rise of institutional investors, trends in global portfolio diversification, and changes in the institutional framework in emerging market economies—on foreign capital flows. As to the cyclical factors, the author finds that global risk aversion and advanced economy interest rates generally are the most important factors driving debt and portfolio equity flows.

Caballero and Krishnamurthy (2006) note that capital inflows come at a cost of exposing the country to bubble-crashes and capital flow reversals. However, they point out that the level of development of domestic financial sector matters when it comes to the potential impact: underdevelopment not only facilitates the emergence of bubbles, but also leads agents to undervalue the aggregate risk embodied in financial bubbles.

Research to date suggests that increased foreign participation is associated with lower bond yields, while the impact on market volatility is ambiguous. The empirical evidence in the context of local currency debt markets is limited. Turner (2012) finds that local currency bond markets, while hit hard by the crisis, remained resilient. Much of the volatility in returns occurred through the currency channel, insulating dollar-hedged investors. Researching foreign participation in the domestic bond markets of ten emerging economies during 2000-09, Peiris (2010) finds that a 1 percent increase in the share of foreign investors is associated with an average of 6-basis point reduction in yields. The author finds no evidence that foreign participation raises volatility.

One key and increasingly important factor that may influence market volatility is the interconnectedness of global capital markets. It does so by increasing the propensity of markets to co-move in response to common shocks. There is evidence that global market liquidity conditions and risk appetite drive at least half of the variance in bond spreads (Gonzales-Rozada and Levy-Yeyati, 2008). However, there is also some evidence that global bond market integration is a stabilizing force. Sienaert (2012) suggests that a “virtuous cycle” may be at work in local currency bond markets: rising foreign investor participation may help absorb more issuance, encouraging market development, which in turn stimulates further demand, including from nonresident investors.

When it comes to the appropriate policy response to capital flows, the literature is largely in agreement that it should depend on the nature (i.e., permanent vs. temporary, portfolio vs. FDI) of those flows. Inflows that are attracted predominantly by a strong domestic economy call for a combination of fiscal tightening and exchange rate appreciation. If, on the other hand, flows are driven by a temporary decline in foreign interest rates, this may warrant a buildup of additional reserve buffers as a cushion for future flow reversals.

As in other EMs, the nonresident flows into the Malaysian government debt securities market may have lowered the cost and smoothed the cyclicity of domestic funding/savings over the years. They may have also contributed to the observed exchange rate volatility. In October 2016, the share of nonresident holdings in conventional MGS was at an all-time high

(52 percent of the outstanding stock; 17 percent of GDP), often associated with sizable underlying gross flows (see below). The MGS market saw a significant reversal of inflows after the 2016 U.S. presidential election and put pressure on the exchange rate.³ This paper attempts to answer the following two questions: Question 1—what is driving the nonresident flows into Malaysia’s MGS market? and Question 2—do these flows contribute to the volatility of the FX market?

The remainder of the paper focuses on the developments in Malaysian debt markets in recent years (Section II) and the findings of an analytical model on the relationship between foreign investment and market volatility (Section III). Section IV concludes.

II. Recent Developments in Malaysia’s Bond Markets

Malaysia has been successful in developing the capital markets, particularly bond markets, in the past decade. The growth over the last decade has benefited both the government, as a major debt issuer, and the private sector. Since the reform on the regulatory framework in 2000/01, the issuance of private debt securities has been growing and become a consistent source of corporate funding. The financial sector, infrastructure, and housing are key sectors benefitting from the strong growth of the bond markets.

The MGS market is one of the most liquid local government debt markets in the world. Recent auctions for government debt have generated healthy bid-to-cover (BTC) ratios, which are consistent across maturities (Table 1).

Table 1. Malaysia: Select Public Debt Auction Results (Q1, 2018)

Issuance	Date	Amount (RM bil.)	BTC ratio
20-year MGS Reopen	1/5/2018	2.00	1.91
5-year MGII Reopen	1/15/2018	4.00	2.58
15-year MGS Reopen	1/29/2018	2.50	2.47
7.5-year MGII New	2/7/2018	3.00	2.28
10-year MGS Reopen	2/28/2018	3.50	2.07
30-year MGII Reopen	3/9/2018	1.50	2.07
7-year MGS New	3/14/2018	3.00	2.35
15-year MGII Reopen	3/23/2018	2.50	2.00
3-year MGS Reopen	30/03/2018	3.00	1.72

Source: Bloomberg.

Malaysia is also home for the largest Islamic bond market in the world. In recent years, the government increased the use of Islamic debt instruments, Malaysian Government Investment Instruments (MGIIs), for funding purposes. The total outstanding stock of government Islamic securities is now rivaling that of MGS, with net issuance of MGIIs having overtaken that of conventional debt securities in 2015 (Table 2). The main reasons

³ A comparable movement out of T-bills was observed at end 2016, as the share of nonresident holdings dropped from 78 percent of total in 2016Q3 to 39 percent in 2016Q4.

behind increasing issuance of sukuk in recent years have been healthy demand and a desire to develop the market. The inclusion of Islamic debt securities in some global bond indexes provided a boost. The primary auctions for MGII have consistently generated higher cover ratios than for equivalent conventional instruments, and the spreads between MGS and MGII instruments have declined steadily over time. The empirical part of this paper focuses on the MGS market alone and leaves aside the MGII, due to the differences in underlying risk and investor base.

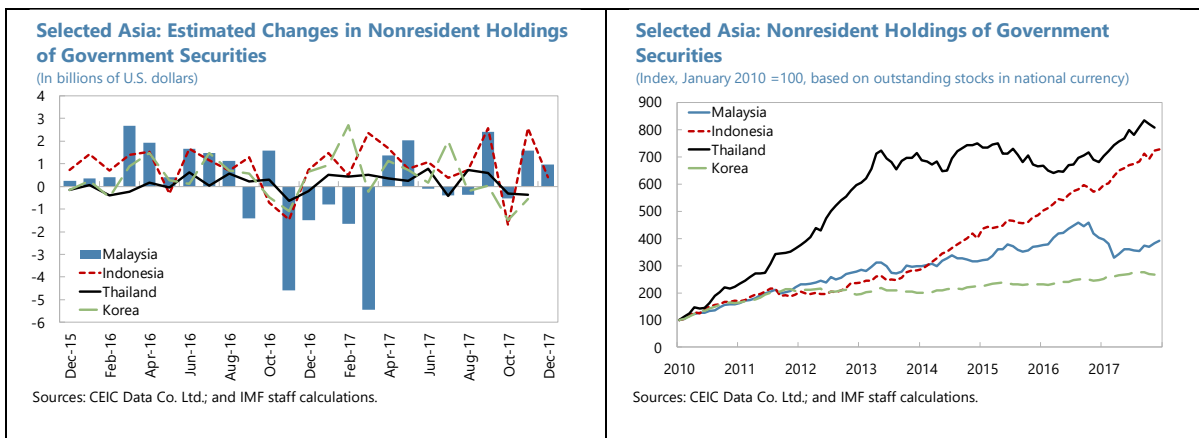
Table 2: Government Bond Issuance (in billion MYR)

		2013	2014	2015	2016	2017E	2018F
Gross issuance	MGS	59	57	54	44	54	53
	GII	41	34	41	43	53	53
	Total	100	91	95	86	107	107
Redemptions	MGS	47	33	44	26	47	39
	GII	12	21	13	22	20	28
	Total	59	53	56	48	67	67
Net issuance	MGS	13	25	10	17	7	14
	GII	29	13	29	21	33	26
	Total	42	38	39	38	40	40

Source: Bond Info Hub, J.P. Morgan estimates.

Lu and Yakovlev (2018) provide a detailed summary of micro-level players and recent developments in the Malaysian bond markets. They give a breakdown of ownership classes among nonresident holders of debt, with asset managers being the largest group (hovering around 40 percent of total nonresident holdings), followed by central banks and governments, pension funds, and commercial banks. The authors suggest that the availability of an efficient foreign exchange derivatives market has helped attract a wider range of foreign investors and enrich the bond market. Figure 1 depicts nonresident investor flows in and out of Malaysian debt markets and compares Malaysia with regional peers.

Figure 1. Nonresident Investments in Government Securities in Select Asian Countries



The risks associated with Malaysia's debt stock are manageable and mostly compare favorably with that of its regional peers (Table 3). Ringgit-denominated securities comprise approximately 95 percent of the stock, limiting the foreign exchange risk. In addition, all of Malaysia's domestic debt is in fixed rate instruments, containing interest rate risk. However, its relatively low average life to maturity (relative to comparators) exposes the stock to some rollover and interest rate risk (at the time of rollover).

Table 3. Central Government Debt in Select Asian Countries (as of December 2016)

	Fixed rate debt share in total	Average maturity, in years	
		Original maturity	Remaining maturity
Hong Kong	67.7	6.0	3.1
Indonesia	94.2	14.1	9.1
Korea	98.2	11.4	7.8
Malaysia	100.0	8.1	5.1
Philippines	97.7	12.9	8.7
Singapore	100.0	12.1	6.7
Thailand	100.0	16.8	10.9

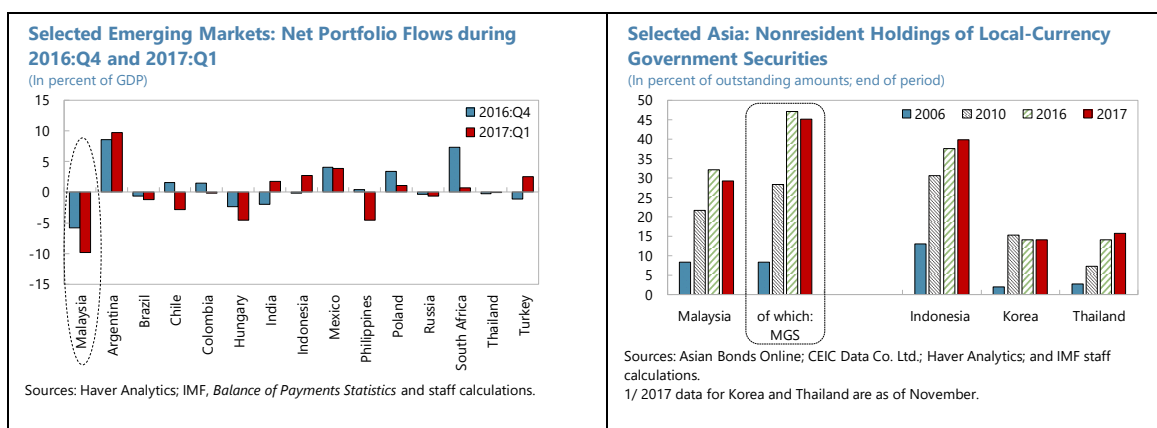
Source: Bank for International Settlements.

However, the volatility of flows has been higher than in regional peers since the Global Financial Crisis, amid a global capital flow surge in the wake of quantitative monetary easing in advanced countries. Following the November 2016 U.S. presidential election, Malaysia experienced a bout of capital outflows similar to that of other emerging market economies (Figure 2, panel A). During 2017Q1, nonresidents' share in MGS holdings kept falling, reaching 38.5 percent by March 2017, while portfolio flows returned to other major emerging markets (Figure 2, panel B).⁴ Asset managers accounted for most of the reduction in nonresident holdings in 2017Q1. Malaysia's weight in the JP Morgan GBI EM global diversified index—one of the main benchmarks for local-currency emerging market fixed-income investors—was reduced from 9 percent at end 2016 to 7½ percent at end March 2017 (and further to 5.6 percent as of December 2017).⁵

⁴ This may have been an outcome of unwinding of short-term speculative positions held by non-resident investors, an intended effect of the December 2016 measures by BNM (see below).

⁵ For the same period, the weights of neighboring Thailand and Indonesia changed only marginally.

Figure 2. Debt Market Flows and Foreign Share in Select EMs



In December 2016 and in the first half of 2017, Bank Negara Malaysia (BNM) announced FX market measures “intended to enhance the liquidity of the foreign exchange (FX) market”⁶ (see Appendix). These measures aimed at (i) increasing FX liquidity onshore by requiring the conversion into ringgits of 75 percent of export proceeds and (ii) extending prudential limits on foreign currency investments by residents with domestic ringgit borrowing to resident exporters, who were previously exempted. As a result, hedging opportunities and the supply of foreign exchange onshore increased; turnover in the onshore spot, forward, and swap FX markets improved, bid-ask spreads narrowed and ringgit volatility declined.⁷ Finally, foreign presence has become less concentrated in shorter maturities.

Nonresident inflows into the MGS market resumed in the second quarter of 2017, driven by both global and domestic factors, including new FMC policy measures. Malaysia’s rapid economic growth and the recovery in global sentiment toward emerging market securities likely helped. By December 2017, nonresidents’ share in the MGS market had risen to about 45 percent of the outstanding stock.

III. Analytical Model

As stated above, the paper aims to answer the following two questions: (1) What is driving the nonresident flows into Malaysia’s MGS market? and (2) Do these flows contribute to the volatility of the FX market?

⁶ Statement by Financial Markets Committee “Initiative to Develop the Onshore Financial Market,” No. 12/16/01, issued on December 2, 2016. Available via: <http://www.bnm.gov.my/>.

⁷ Some of these developments could have also been due to the rebound of capital inflows to emerging markets in early 2017.

Determinants of Capital Flows

To answer Question 1 (page 6), we estimated a model based on the following (unobserved) supply and demand functions for bonds:

$$\text{Supply: } \quad bondi_t = \alpha_0 - \alpha_1 dMGS_t + \alpha_2 BB_t + \alpha_3 Controls_t + \varepsilon_t \quad (1)$$

$$\text{Demand: } \quad dMGS_t = \beta_0 + \beta_1 bondi_t - \beta_2 VIX_t + \beta_3 Controls_t + v_t \quad (2)$$

Where variables are defined as follows:⁸

<i>bondi</i>	Nominal yield on 1-year MGS (annualized);
<i>BB</i>	General government budget balance (percent of GDP);
<i>dMGS</i>	Net change in NR position in MGS market (percent of GDP);
<i>VIX</i>	Global stock market volatility index.

Fiscal policy (*BB*) is determined largely independently of the financing choices (therefore it is assumed to be exogenous) and, together with the nonresident flows, influences bond yields. Similarly, *VIX* is a variable exogenous to the MGS market but along with bond yields determines the appetite of nonresident investors for MGS. Substituting (2) into (1) results in the reduced form equation containing (on the right-hand side) all exogenous and control variables:

$$bondi_t = k_0 - k_1 VIX_t + k_2 BB_t + k_3 Controls_t + \omega_t \quad (3)$$

Since both equations are identified (due to the presence of at least one exogenous variable in each), a Two-Stage Least Squares approach (2SLS) was chosen for estimation, augmented for autocorrelation (see below). In the first stage, *bondi* is regressed on *all* exogenous variables and controls (equation 3). In the second stage, *dMGS* is regressed on the fitted value of *bondi* (i.e., *bondihat*) from the first stage and *own* exogenous variable (*VIX*) and control variables (equation 4).

$$dMGS_t = \gamma_0 + \gamma_1 bondihat_t - \gamma_2 VIX_t + \gamma_3 Controls_t + \theta_t \quad (4)$$

For the purpose of estimation, five control variables were added to the regressions: (i) the nominal yield on 1-year US treasury bonds, annualized (*USrate*); (ii) the consumer price inflation, annualized (*Inflation*); (iii) the general government debt, in percent of GDP (*Debt*); (iv) the depreciation of the ringgit/US\$ exchange rate, log of ratio (*Depreciation*); and (v) the standard deviation of daily ringgit/US\$ exchange rates within each quarter (*StdevFX*).

Finally, the following dummy variables were added: (i) *PostGFCdummy*, for the Global Financial Crisis; (ii) *TtantrumDummy*, for Taper Tantrum; and (iii) *PostMeasuresDummy*, for the December 2016 FX market measures. Quarterly series (for 2005Q1–2017Q2) were used in the estimation to minimize the potential effect of the debt issuance calendar on nonresident flows. After testing for (and finding strong evidence of) autocorrelation, we

⁸ Data series used in the paper are provided by the authorities, IMF's International Financial Statistics Database, and Bloomberg.

estimated the equation using Prais–Winsten transformation (a Generalized Least-Squares method) to account for serially correlated errors.⁹ Doing so raised the value of Durbin-Watson statistic in the first stage regression from 0.69 to 1.93. Results are reported in Table 4. (To obtain a more parsimonious specification of the second stage regression, variables with statistically insignificant coefficients, with the expectation of the fitted value of the bond yield, were dropped. Estimates are reported in the final column).

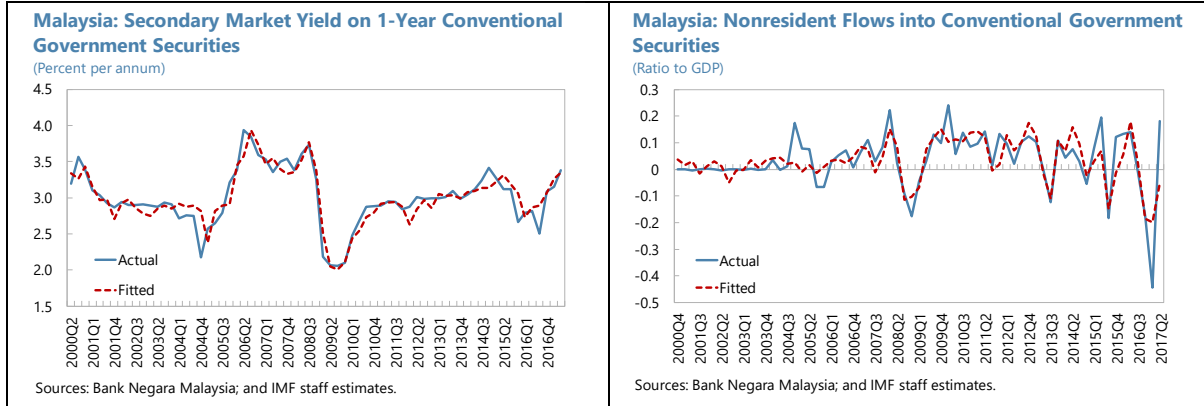
Table 4. Two-stage Least Squares (2SLS) Regression Results

	Dependent variable:					
	Bondi (1st Stage)		Nonresident flows (2nd Stage)			
	Coef.	t-stat.	Coef.	t-stat.	Coef.	t-stat.
Bondihat			0.057	1.47	0.050 [^]	1.55
Debt	0.22***	3.72				
Budget Balance	-0.01	-0.79				
USrate	0.15***	2.61	-0.002	-0.24		
Inflation	0.058**	2.20	-0.015*	-1.95	-0.016*	-1.92
VIX	0.00002	0.05	-0.002*	-1.82	-0.002**	-2.10
StdevFX	-1.66	-1.45	-0.848*	-1.84	-0.897**	-2.03
Depreciation			-0.016***	-4.05	-0.016***	-4.59
PostGFCDummy	0.42**	2.04	1.13***	2.84	0.122***	4.32
TtantrumDummy	0.072	0.50	-0.113**	-2.02	-0.115**	-2.15
PostMeasuresDummy	0.3	1.46	-0.232***	-4.73	-0.230***	-4.82
Q2dummy	0.065	1.47	0.004	0.17		
Q3dummy	0.124**	2.33	-0.017	-0.65		
Q4dummy	0.069	1.57	0.003	0.13		
Constant	3.77***	4.72	-0.06	-0.58	-0.052	-0.52
No. of observations	70		69		69	
R-sq.	0.67		0.58		0.58	
F-stat.	9.66		7.23		10.2	

Note: ***, **, *, and [^] indicate significance at 99, 95, 90, and 87 percent confidence levels, respectively.

Figure 3 depicts actual and predicted values of the interest rate and nonresident flows, confirming the model's good fit.

⁹ Similar to Cochrane–Orcutt procedure commonly used for addressing autocolleration, the Prais–Winsten transformation has a benefit of not wasting an observation, which is valuable for small sample regressions.

Figure 3. Actual vs. Fitted Values of Dependent Variables

The following are the summary findings based on the results reported in Table 4:

- Bond yields respond to supply and demand factors as expected, with the coefficients on public debt, the US Treasury bond rate, and CPI inflation having the expected sign and statistical significance;¹⁰
- Nonresident flows respond adequately to both domestic/pull (proxied by debt, inflation, depreciation, and exchange rate volatility) and foreign/push factors (proxied by VIX and the US Treasury bill yields), suggesting risk aversion;
- Nonresident flows are deterred (strongly) by foreign exchange volatility as well as expected depreciation;
- Nonresident flows were affected by the introduction of the December 2016 measures, with the (negative) coefficient on PostMeasuresDummy twice as large as the one on TtantrumDummy.

Capital Flows vs. Volatility

To answer Question 2 (page 6), we switch to monthly series (using data for June 2005 through October 2017) to assess the short-term dynamics of the exchange rate and its interplay with other factors. A Generalized Autoregressive Conditional Heteroscedasticity (GARCH) model is the most appropriate methodology given the characteristics of the depreciation series. Following the finance literature (see Engle, 1982; Bollerslev, 1986), we employ a standard GARCH (1,1) structure:

$$\ln\left(\frac{e_t}{e_{t-1}}\right) = \mu + time + \varepsilon_t \quad (5)$$

$$\omega_t^2 = \alpha\beta_0 + \alpha_1\varepsilon_{t-1}^2 + \alpha_2\omega_{t-1}^2 + \alpha_3dMGS_t + v_t \quad (6)$$

¹⁰ The coefficient on budget balance has the right sign but is not statistically significant.

Where $Var(\varepsilon_t) = \omega_t^2$, ε_{t-1}^2 represents (the square of) past innovations (ARCH component) and ω_{t-1}^2 represents the lagged forecast variance (GARCH component). The model essentially assumes that exchange rate is subject to time-varying trend and an error term, which depends on its past realization and variance as well as some exogenous factors.

The results of the estimation are reported in Table 5. The baseline specification (columns 1–2) suggests that contemporaneous values of nonresident bond flows are associated with lower (not higher) exchange rate volatility. Since this could reflect the effect of policy (i.e., BNM’s intervention in the FX market to smooth volatility), we replaced the contemporaneous values with the lagged value of the nonresident flows (results reported in columns 3-4).¹¹ The relationship becomes statistically insignificant, suggesting no firm evidence in the model that the nonresident flows cause exchange rate volatility.

Table 5. GARCH Model Estimation Results

	<i>Dependent variable: depreciation</i>					
	Coef.	z score	Coef.	z score	Coef.	z score
Depreciation						
Constant	-0.0062***	-2.80	-0.0054**	-2.25	-0.0045**	-2.26
Time	0.00004	1.45	0.00005*	1.70	0.00006**	2.04
Crude oil price change					-0.064***	-4.96
Heteroskedasticity						
dMGS	-0.0006***	-3.55				
dMGSlag			0.00044	1.07	-0.00004	-0.15
PostGFCdummy					0.99**	2.15
ARCH						
Arch	0.23**	2.01	0.23**	2.17	0.19*	1.70
Garch	0.51***	4.74	0.67***	4.77	0.5*	1.87
No. of observations	148		147		147	

Note: ***, **, and * indicate significance at 99, 95, and 90 percent confidence levels, respectively.

A third specification was also estimated: To account for other factors that may influence both the trend as well as volatility of the exchange rate (e.g., via current account), we included crude oil price change in equation 5 and PostGFCdummy in equation (6). The results are reported in columns 5-6.

Based on the above results, the following conclusions can be drawn:

¹¹ While this still is not a formal test of casualty lagging the independent variable shows that the relationship between capital flows and foreign exchange volatility breaks apart.

- Exchange rate behavior demonstrates dependence on past realization of “innovation” and variance (estimates of both α_1 and α_2 are positive and significant), suggesting that exchange rate volatility in Malaysia has a persistent pattern;
- The model shows no statistically significant positive contribution of nonresident flows to exchange rate volatility (measured by the variance of the ringgit exchange rate);
- Crude oil prices have an expected effect on devaluation and exchange rate volatility has gone up since the start of the global financial crisis.

IV. Conclusions

The role of nonresident investments in Malaysia’s local currency bond market has been a subject of much discussion. This paper surveyed the recent literature on capital flows into domestic debt markets and discussed the arguments for allowing more foreign participation in domestic debt markets. It also built an empirical model to analyze the determinants of the flows and their impact on exchange rate volatility in Malaysia. The results suggest that the public debt market in Malaysia responds adequately to both domestic and foreign factors and find no firm direct evidence that nonresident flows cause observed exchange rate volatility on the onshore market beyond what can be smoothed by policy intervention. Instead, exchange rate volatility shows significant path-dependency and has increased since the start of the global financial crisis. It is also worth noting that the exchange rate responds adequately to terms-of-trade shocks (i.e., oil price fluctuations), which cause volatility. Another source of exchange rate volatility could be activity in the NDF markets, which—for a given level of nonresident flows—could create additional pressure on onshore ringgit/USD exchange rate.¹²

It is useful to note that despite the sizable nonresident holdings of MGS, the existence of a large institutional domestic investor base has helped maintain orderly market conditions in that market. Looking forward, such conditions would be helped by wider fiscal/treasury buffers. The costs associated with maintaining such buffers could be viewed as an insurance premium for lowering the risks associated with possible large-scale selloffs.

Future research could investigate whether these conclusions hold symmetrically during both nonresident inflows and outflows by using an asymmetric GARCH model. It may also be useful to explicitly control for other activities that have bearing on foreign exchange volatility (e.g., FDI flows, forex derivative markets, etc.) while assessing the impact of nonresident investors.

¹² Due to high correlation between nonresident activity in the MGS and NDF markets (and potential endogeneity issues between the two), explicitly controlling for this channel in the regression framework is left for future research.

References

- Andritzky, Jochen, 2012. "Government Bonds and Their Investors: What Are the Facts and Do They Matter?," IMF Working Paper 12/158 (Washington: International Monetary Fund).
- Arslanalp, Serkan and Takahiro Tsuda, 2014. "Tracking Global Demand for Emerging Market Sovereign Debt," IMF Working Paper 14/39 (Washington: International Monetary Fund).
- Bollerslev, Tim, 1986. "Generalized Autoregressive Conditional Heteroscedasticity," *Journal of Econometrics* 31, pp. 307-327.
- Caballero, Ricardo and Arvind Krishnamurthy, 2006. "Bubbles and Capital Flow Volatility: Causes and Risk Management," *Journal of Monetary Economics* 53, Issue 1, pp. 35-53.
- Calvo, G., and E. Mendoza, 1996. Mexico's Balance-of-payments Crisis: A Chronicle of Death Foretold." Board of Governors of the Federal Reserve System, International Finance Discussion Paper No. 545.
- Engle, Robert, 1982. "Autoregressive Conditional Heteroscedasticity with Estimates of the Variance of United Kingdom Inflation," *Econometrica* 50, Issue 4, pp. 987-1007.
- Grigorian, David and Vlad Manole, 2017. "Sovereign Risk and Deposit Dynamics: Evidence from Europe," *Applied Economics* 49, Issue 29, pp. 2851-2860.
- Gonzalez-Rozada, Martin and Eduardo Levy Yeyati, 2008. "Global Factors and Emerging Market Spreads," *Economic Journal* 118, Issue 533, pp. 1917-1936.
- Koepke, Robin, 2015. "What Drives Capital Flows to Emerging Markets? A Survey of the Empirical Literature," Institute of International Finance Working Paper.
- Lu, Yinqiu and Dmitry Yakovlev, 2018. "Instruments, Investor Base, and Recent Developments in the Malaysian Government Bond Market," IMF Working Paper 18/95 (Washington: International Monetary Fund).
- Lu, Yinqiu, and Dmitry Yakovlev, 2017. "Exploring the Role of Foreign Investors in Russia's Local Currency Government Bond (OFZ) Market," IMF Working Paper 17/28 (Washington: International Monetary Fund).

Peiris, Shanaka Jayanath, 2010. "Foreign Participation in Emerging Markets' Local Currency Bond Markets," IMF Working Paper 10/88 (Washington: International Monetary Fund).

Sienaert, Alex, 2012. "Foreign Investment in Local Currency Bonds Considerations for Emerging Market Public Debt Managers," World Bank Policy Research Working Paper 6284 (Washington: The World Bank Group).

Turner, Philip, 2012. "Weathering Financial Crisis: Domestic Bond Markets in EMEs," Bank for International Settlements Paper 63.

Appendix: Recent FX Market Measures in Malaysia

On December 2, 2016, The Financial Markets Committee (FMC, instituted by BNM in mid-2016) announced a package of measures designed to foster the development of the onshore FX markets. The measures include the following:

- To enhance further onshore FX risk management, both resident and nonresident institutional investors can dynamically take onshore forward positions on a portfolio basis up to 25 percent of foreign currency or ringgit-denominated assets, without documentary evidence, with a licensed onshore bank or an appointed overseas office. A one-time registration with BNM is required.
- Residents can hedge foreign currency exposures and cancel hedging positions for US\$/MYR and CNH/MYR currency pairs with a licensed onshore bank without documentary evidence up to an aggregate net open position limit of 6 million ringgits per licensed onshore bank. Participants also must give a one-time declaration of hedging intent.
- With effect from December 5, 2016, resident exporters can retain up to 25 percent in foreign currency proceeds from their exports of goods and the balance should be converted into ringgit with a licensed onshore bank. The converted amounts could be deposited in a special facility, earning a higher interest rate of 3.25 percent and available until end-2017. (On December 14, 2017, the BNM announced that the special facility will be discontinued by year-end. Outstanding balances in the facility can continue earning 3.1 percent interest up to March 31, 2018). However, exporters can reconvert their export proceeds to meet projected loans, imports, and other current account obligations for up to six months ahead. Previously, export proceeds were required to be repatriated within six months, but there was no conversion requirement. This measure aims to enhance onshore FX liquidity, while it could potentially increase the transaction costs for exporters.
- Prudential limits on foreign currency (FC) investments by residents with domestic ringgit borrowing have been extended to include FC investments onshore and apply to all residents (including previously exempted exporters) with ringgit borrowing for prudential reasons. These measures could limit some of these residents' FC investments abroad, while those without domestic ringgit borrowing may continue to invest up to any amount.
- Prior to the December 2016 announcements, the BNM also enhanced the enforcement of the existing regulations on banks' non-involvement in offshore ringgit transactions. Onshore banks engaging in ringgit foreign exchange transactions in the onshore market were required to obtain attestation from non-resident banks of non-participation in the non-deliverable forward (NDF) market. The requirement that

onshore banks do not participate in or facilitate offshore ringgit derivative trading has been in place since 1998.

In April 2017, the FMC announced a second series of initiatives to develop onshore financial markets, which came into effect on May 2, 2017:

- Following feedback from financial market participants, the December 2016 hedging flexibilities were extended whereby registered investors can fully hedge and actively manage their exposures including unwinding of hedging positions—up to 100 percent (from 25 percent) of their underlying assets. In addition, the flexibility to actively manage FX risk exposures up to an aggregate net open position limit of 6 million ringgits per client per bank without documentary evidence was expanded to include GBP, EUR, and JPY (in addition to the US\$ and CNH).
- Supporting the aspiration to promote a financial market that is trusted, competitive, and resilient, Principles for a Fair and Effective Financial Market were introduced, in a document outlining five universal principles as guidance and serving as an anchor to promote a fair and effective functioning of financial markets. A Code of Conduct for Malaysian Wholesale Financial Markets was also issued. The Code of Conduct sets out the principles and standards to be observed by market participants and the role of industry associations in preserving market order and stability.
- To improve liquidity in the conventional secondary government securities (MGS) market and facilitate more effective hedging of interest rate risk, the regulated short-selling framework was liberalized to allow all residents to participate in short-selling activities.
- To support future market development, induce greater transparency and facilitate surveillance on the onshore financial market, information reporting and settlement infrastructure was enhanced. The large value payment system, Real-time Electronic Transfer of Funds and Securities System (RENTAS), was enhanced via development of segregated securities accounts up to fund manager level. The system will be able to ease reporting burden on custodians, provide real-time information for surveillance purposes and benefit the market through publication of detailed information.

During a speech delivered at an event sponsored by the Financial Market Association of Malaysia on November 17, the BNM Governor announced the following measures adopted by the FMC to further deepen onshore financial markets¹:

- Extending the short-selling framework to Malaysian government investment issues (MGII) by both conventional and Islamic banks to increase liquidity and boost trading activities for these Islamic securities in the secondary market as well as tighten the pricing gaps and yield differences between MGS and MGII.

- Expanding the eligible collateral for liquidity operations with the BNM to include Bankers Acceptances (BAs) and Negotiable Instruments of Deposits (NIDs) issued by AAA-rated onshore licensed banks. This will enable banks to obtain liquidity under BNM's Standing Facilities by pledging these money market instruments. The measure is expected to provide an impetus to the trading activities of NIDs and BAs and improve pricing.
- Introducing Bank Negara Interbank Bills (BNIBs) in ringgit and foreign currency, made available to onshore banks through auctions to manage ringgit and foreign currency liquidity and interest rate exposures and help provide competitive pricing on FX for all tenors.