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## ASEAN-5 CLUSTER REPORT—EVOLUTION OF MONETARY POLICY FRAMEWORKS

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# ASEAN-5 CLUSTER REPORT

## EVOLUTION OF MONETARY POLICY FRAMEWORKS

May 9, 2016

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## EXECUTIVE SUMMARY

This thematic cluster report examines the evolution of monetary policy frameworks of the ASEAN-5 economies, with particular focus on changes since the Asian financial crisis (AFC) and the more recent period of unconventional monetary policies (UMPs) in advanced economies (AEs). Monetary policy frameworks of the ASEAN-5 economies have on the whole performed well since the AFC, delivering both price and financial stability during a period of significant domestic and regional transformation, and global macroeconomic and financial turmoil. Not surprisingly, therefore, success in terms of outcomes in most cases entailed significant changes to operating frameworks and refinement of policy objectives.

The explicit or implicit inflation targeting frameworks put in place post-AFC have served the ASEAN-5 economies well as in other emerging market economies (EMEs), but they faced new challenges. In the wake of the global financial crisis (GFC), many EMEs found the monetary policy of “center” countries imperfectly calibrated, and in many cases out of sync, to their own domestic macroeconomic and financial stability conditions and other concerns. EMEs’ central banks—including the ASEAN-5’s—were therefore compelled to adapt their policy framework and toolkits in order to strengthen policy autonomy and mitigate risks.

Greater exchange rate flexibility helped strengthen monetary policy autonomy but open capital accounts and the global financial cycle made domestic financial conditions highly susceptible to global financial factors. ASEAN-5 policy rates were also pushed down beyond what can be attributed to the central banks usual response to domestic output and price developments, particularly during the UMP period. The generalized reduction in global interest rates and loose liquidity conditions increased the risks of boom and bust cycles of credit and asset prices.

The ASEAN-5 economies have avoided broad based credit booms and used macroprudential policies (MPPs) to address systemic risks posed by sectoral leverage and asset price cycles. A lesson from the GFC in AEs is that maintaining price stability alone is insufficient to secure macroeconomic stability because of macrofinancial linkages. It is also essential for central banks and financial regulators to monitor and manage liquidity and credit conditions and the strength of the balance sheets of the banks, corporate and household sectors.

Monetary policy in the ASEAN-5 economies managed to effectively control inflation by influencing the interest rate structure and aggregate credit conditions while using targeted MPPs to address financial stability concerns. Capital flow management measures (CFMs) were used to manage capital inflow surges and overlapped with MPPs to address systemic risks at times. Foreign exchange (FX) intervention responded to potentially disruptive volatile capital flows and market conditions. The move to a more flexible exchange rate regime in the region is consistent with Fund policy advice in Article IV consultations, which along with the adoption of stricter microprudential policies, helped avoid a buildup of short-term foreign currency debt and allowed the exchange rate to act as a shock absorber during the GFC and post-taper tantrum capital outflow episodes. The reserve buffers built up during the great moderation and UMP period were also drawn down in some cases close to the lower bound of the Fund’s reserve adequacy metric range, albeit with a number of countries continuing to maintain reserves above the range, at significant quasi-fiscal costs.

Going forward, the normalization of monetary policies in center economies should permit greater monetary policy independence in the ASEAN-5 economies, even with reduced recourse to nontraditional tools. Nonetheless, further evolution of the frameworks can be expected in response to rising leverage and dwindling policy buffers in the context of volatile capital flows and asynchronous monetary policies in AEs. Deepening cross-border financial integration, including in the context of the ASEAN Economic Community's goal of achieving financial liberalization and freer capital flows within the ASEAN region by 2025 pose additional challenges.

The ASEAN-5 central banks broadly agreed with the analyses and findings of the report.<sup>1</sup> In particular, all five central banks highlighted the shift to greater exchange rate flexibility, the buildup in FX reserves, and enhanced financial surveillance post-AFC as key factors that reduced vulnerabilities and strengthened resilience to the GFC. They also emphasized the spillovers to domestic financial conditions from liquidity shocks emanating from the global financial cycle. In the more recent period of UMPs in AEs, ASEAN-5 central banks were compelled to refine their policy frameworks to strengthen monetary policy effectiveness and broaden toolkits further building on their experiences with MPPs post-AFC in order to address financial stability risks, as noted in the report.

## EVOLUTION OF MONETARY POLICY FRAMEWORKS

### A. Introduction

Monetary policy frameworks of the ASEAN-5 economies have on the whole performed well since the AFC, delivering both price and financial stability. The flexible inflation targeting frameworks put in place post-AFC alongside the move to greater exchange rate flexibility has served the ASEAN-5 economies well and provides lessons to other EMDEs. The region was also relatively resilient to the GFC as a result of a decade of financial and structural reforms following the AFC with refinements to the monetary policy framework playing an important role. However, the generalized reduction in global interest rates and loose liquidity conditions during the great moderation and UMP period pose a challenge to the traditional "trilemma" view as flexible exchange rates could not fully insulate economies from the global financial cycle, when the capital account is highly open.

The ASEAN-5 central banks were therefore compelled to adapt their policy framework and toolkits in order to strengthen policy autonomy and dampen risks. The policy toolkit has been broadened to MPPs to address systemic risks, and CFMs/FX intervention to manage volatile capital flows. The fallout, sources of resiliency and policy responses associated with capital outflow episodes provide valuable lessons for the current juncture where EMEs including the ASEAN-5 are facing the prospect of a prolonged period of capital outflows and risks of global financial volatility (IMF 2016a, b).

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<sup>1</sup> The analytical content and findings of this report were presented to the ASEAN-5 central banks over the past six months during their recent Article IV consultations and/or staff visits.

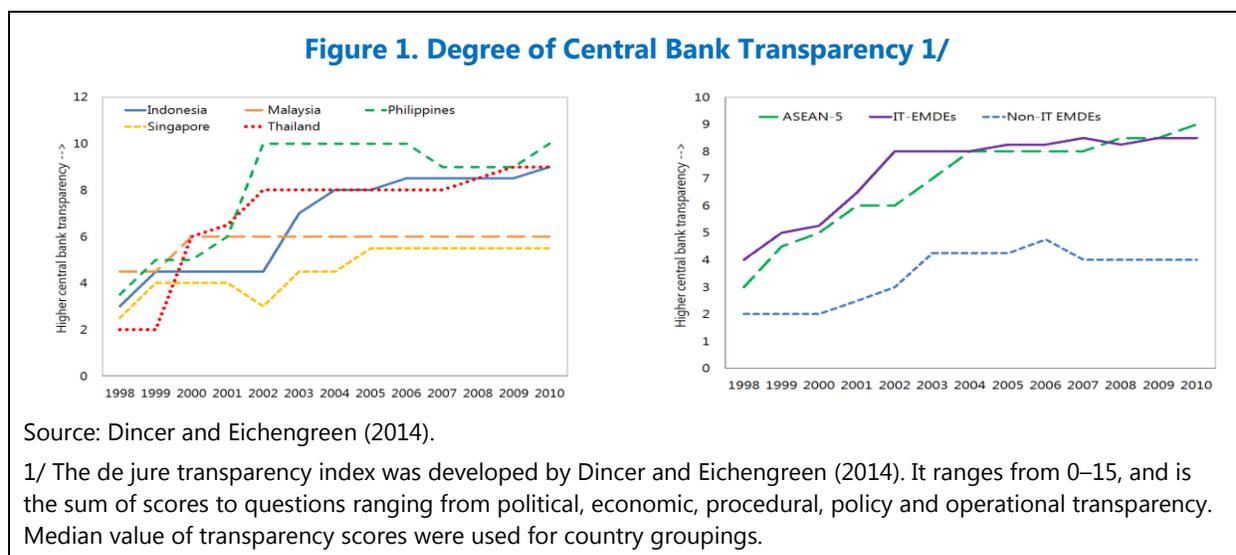
The cluster report complements the individual ASEAN-5 country reports by focusing on structural dimensions and past responses of monetary and exchange rate policies to common and idiosyncratic shocks, thereby giving context to the Article IV coverage of conjunctural policy settings. The report addresses three broad themes:

- It examines how monetary policy regimes have evolved since the AFC, to show how they have elected to accommodate the constraints imposed by the impossible trinity, highlighting similarities and differences across time and countries. While countries have generally moved toward greater exchange rate flexibility and capital account openness, they have also accumulated FX reserves to strengthen their external positions and smooth exchange rate fluctuations, while not targeting a specific level of the exchange rate
- The report then considers the channels through which global financial conditions have impacted domestic financial markets and monetary conditions. It assesses empirically the transmission of “center economy” monetary policy to domestic short- and long-term market interest rates, and retail bank rates. The results suggest the existence of a global financial cycle emanating from changes in U.S. monetary policy and global risk aversion that drives domestic financial conditions in the ASEAN-5 economies. However, policy rates and active liquidity management continued to be effective in influencing the retail bank rates and the yield curve.
- The third section of the report explores how monetary policy has responded to these challenges as well as the role of MPPs and other tools to manage volatile capital flows. To assess the former, we compare the behavior of the primary monetary policy instrument against forecasts based on country-specific estimated Taylor rule reaction functions including the weight placed on policy goals other than inflation. The ASEAN-5 economies also increased their reliance on MPPs to address systemic risks, particularly sectoral leverage and asset price cycles. CFMs and FX intervention were used as part of the toolkit to manage volatile capital flows in line with the Fund’s institutional view with a greater reliance on exchange rate flexibility to cushion against capital flow shocks. A concluding section discusses the lessons from the ASEAN-5 experience.

## B. ASEAN-5 Monetary Policy Frameworks

**1. The monetary policy framework encompasses the institutional structure of the central bank as well as the specification of its goals, instruments, strategy, operating targets and procedures, and communications** (IMF 2015a). The institutional setup includes the central bank’s statutory mandate, governance structure, and decision-making processes. The monetary policy strategy guides the setting of the central bank’s operating targets, and its operating procedures, and specify how its policy instruments should be adjusted to implement those targets. Central bank communication aids the public in understanding the policy framework as well as the rationale for specific policy decisions and helps shape market expectations. It promotes transparency and accountability of the central bank. A general consensus has emerged on the set of principles that characterize effective policy frameworks in countries with scope for independent monetary policy (IMF 2015a).

**2. ASEAN-5 monetary policy frameworks have evolved to embody the key characteristics of a coherent forward-looking monetary policy framework** (Appendix I). In particular, Indonesia, Philippines and Thailand adopted an inflation targeting (IT) framework while Singapore developed a more rigorous implicit IT regime. Bank Negara Malaysia adopted a fixed exchange rate regime in the aftermath of the AFC but in 2005, it moved to a flexible exchange rate regime and a monetary policy framework that focus on price stability but also takes into consideration on the impact of monetary policy on financial stability. While the frameworks differ in terms of their exact characteristics, especially with respect to instruments, operating targets, and intermediate targets, all of the ASEAN-5 central banks generally have a clear statement of internally consistent goals of policy, the institutional arrangements that give the central bank the freedom to pursue these goals, and transparency and effective communication with respect to its goals and policy actions (see Appendix I). Price stability is the primary objective of monetary policy over the policy horizon for all ASEAN-5 central banks although many of them are also required to consider output and employment conditions as in other AEs and EMEs.<sup>2</sup> The clear independent operation frameworks also enhance the central bank's accountability for fulfilling its objectives that are well communicated to the general public and market participants through regular reports, press conferences, and dialogue. Even in the somewhat special cases of Malaysia and Singapore where the inflation and intermediate targets, respectively are not explicitly disclosed, the policy actions and intentions are well articulated to the market so that market participants have a good idea of what the central banks' tolerance levels are for inflation. The central bank transparency scores for the ASEAN-5 are comparable to other IT EMEs reflecting the strong communication and transparency practices of the ASEAN-5 central banks (Figure 1).



<sup>2</sup> External stability is also an explicit objective in Indonesia as observed in a few other EMEs (see Ostry and others, 2012).

**3. The ASEAN-5 monetary policy frameworks have delivered a strong inflation performance similar to other IT emerging market and developing economies (EMDEs).** Most EMDEs have achieved lower inflation amidst marginal declines in growth between the periods 1991–2000 and 2001–2014. However, countries that adopted IT regimes have reduced inflation and volatility more than their non-IT counterparts (IMF 2015a and Roger 2010). The ASEAN-5 economies have also reduced output and inflation volatility, reaching levels achieved by IT economies after adopting IT regimes (Figure 2). Looking more closely, the ASEAN-5 IT countries (Indonesia, Philippines and Thailand) have performed even better with higher GDP growth and lower inflation as well as lower GDP growth and inflation volatility, probably reflecting greater scope for catch up and stabilization as well as other potential factors at play.

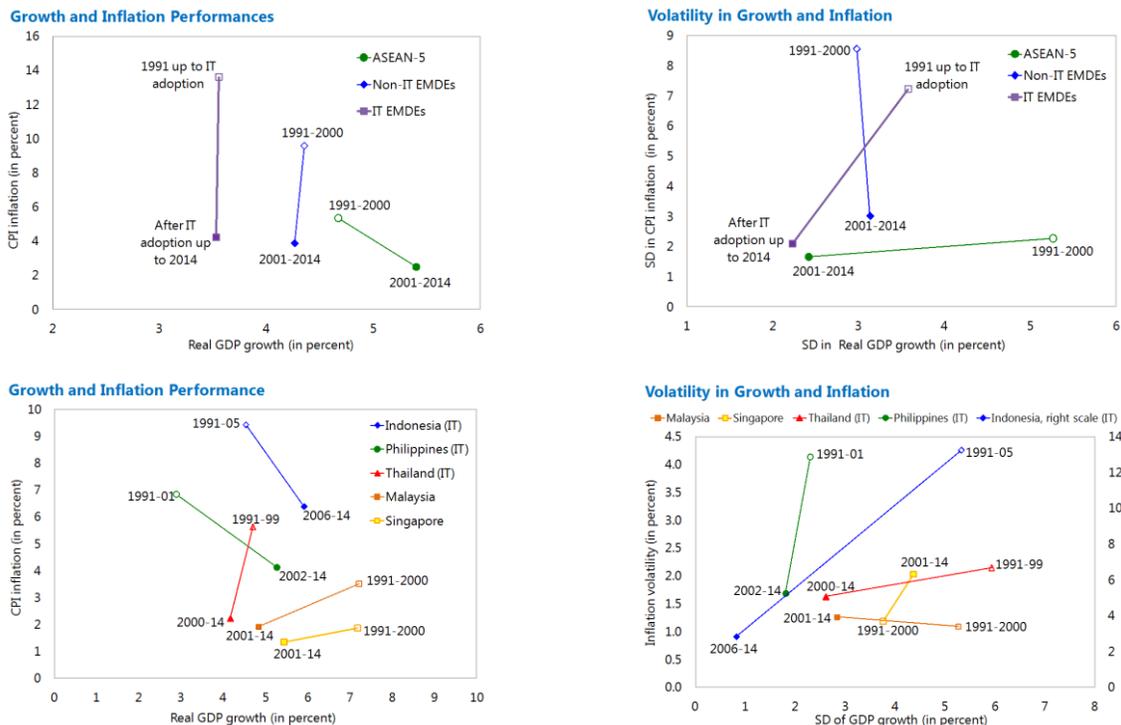
### C. Impossible Trinity

**4. Greater exchange rate flexibility has bestowed monetary policy autonomy.** To present the evolution of the policy choices of the ASEAN-5, monetary trilemma triangles are calibrated for each country following Aizenmann, Chinn and Ito (2012), with some adjustments.<sup>3</sup> We focus on three non-crisis periods 1990–96, 2000–07, and 2010–14 to avoid outliers. Comparing the post-GFC period (2010–14) with the pre-AFC period (1990–96), all ASEAN-5 economies have moved toward greater monetary policy autonomy, generally by forgoing exchange rate stability (Figure 3). However, the transition from the pre-AFC to the post-GFC regimes has been different across countries:

- Before the AFC, Indonesia had a crawling peg exchange rate system and an open capital account, which limited its ability to set interest rates. After the AFC, Indonesia adopted a more flexible exchange rate regime, which allowed it greater independence in setting its interest rate. Since the GFC, Indonesia increased its exchange rate flexibility and introduced CFM measures, providing further autonomy to set interest rates.
- Before the AFC, Malaysia had a managed exchange rate and an open capital account, which provided limited scope to set domestic interest rates. After the AFC, Malaysia fixed the exchange rate and managed the capital account in order to be able to gain some monetary independence. Malaysia de-pegged its exchange rate in 2005 and adopted a more flexible exchange rate regime and liberalized its capital account, which provided greater autonomy to set interest rates during and after the GFC.

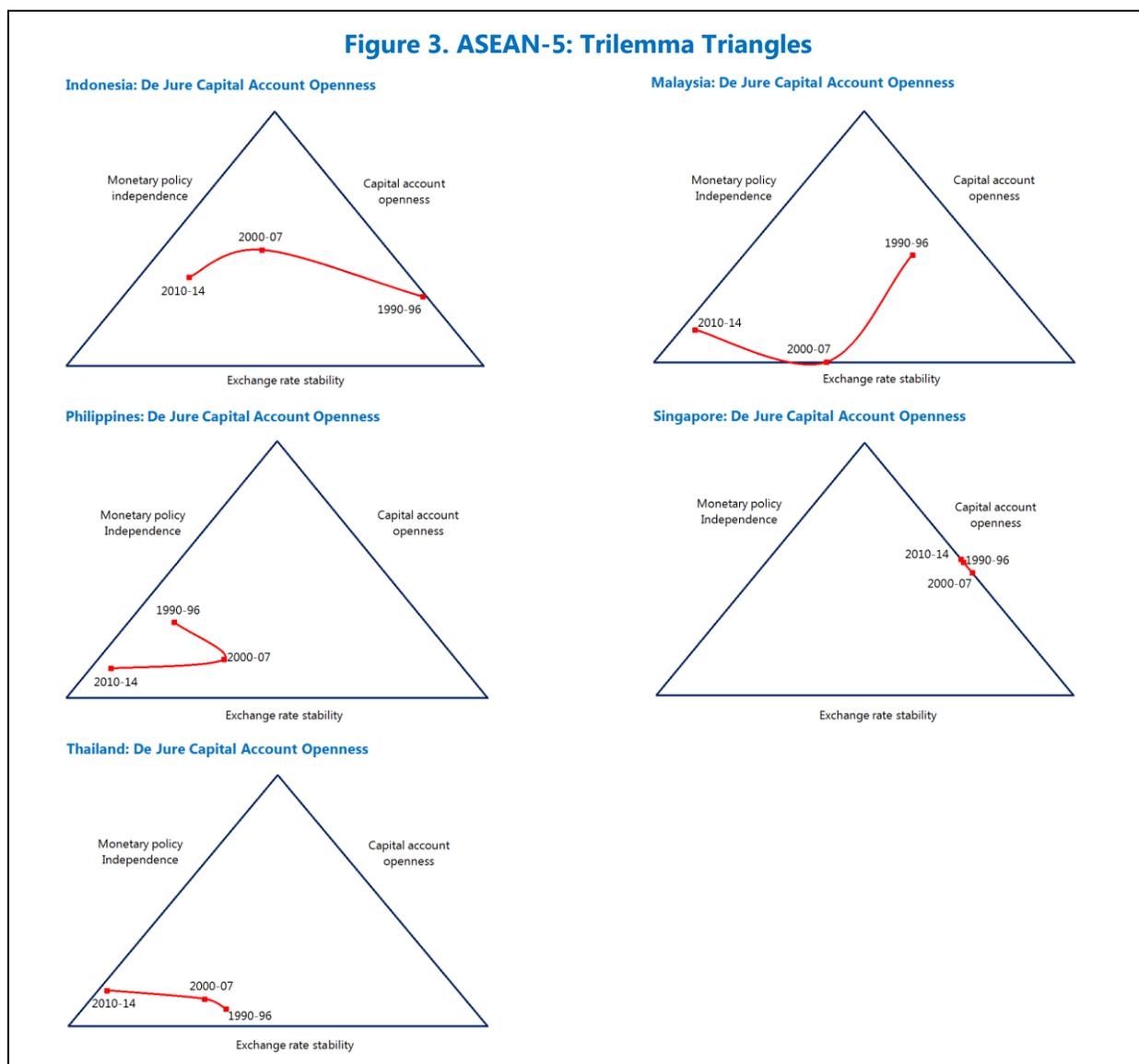
<sup>3</sup> This framework, first introduced by Mundell and Fleming in the 1960s, states that a country may simultaneously choose any two, but not all three of the following policy goals: monetary policy autonomy, exchange rate stability, and capital account openness. In practice, however, countries rarely face the binary choices stated above. Instead, they chose intermediate levels of all three goals. The three indexes are normalized to lie between 0 and 1 and to sum up to two every year.

**Figure 2. ASEAN-5: Growth and Inflation 1/–3/**



- 1/ Following Roger (2010), hollow symbols represent periods from 1991 to 2000 or up to year of IT adoption. Filled in symbols represent periods from 2001 or a year after IT adoption to 2014. The straight lines represent the direction of movement between the two periods.
- 2/ Median value of country averages were used for real GDP growth; median of median values for inflation.
- 3/ Median standard deviation for growth and inflation were used for volatility.

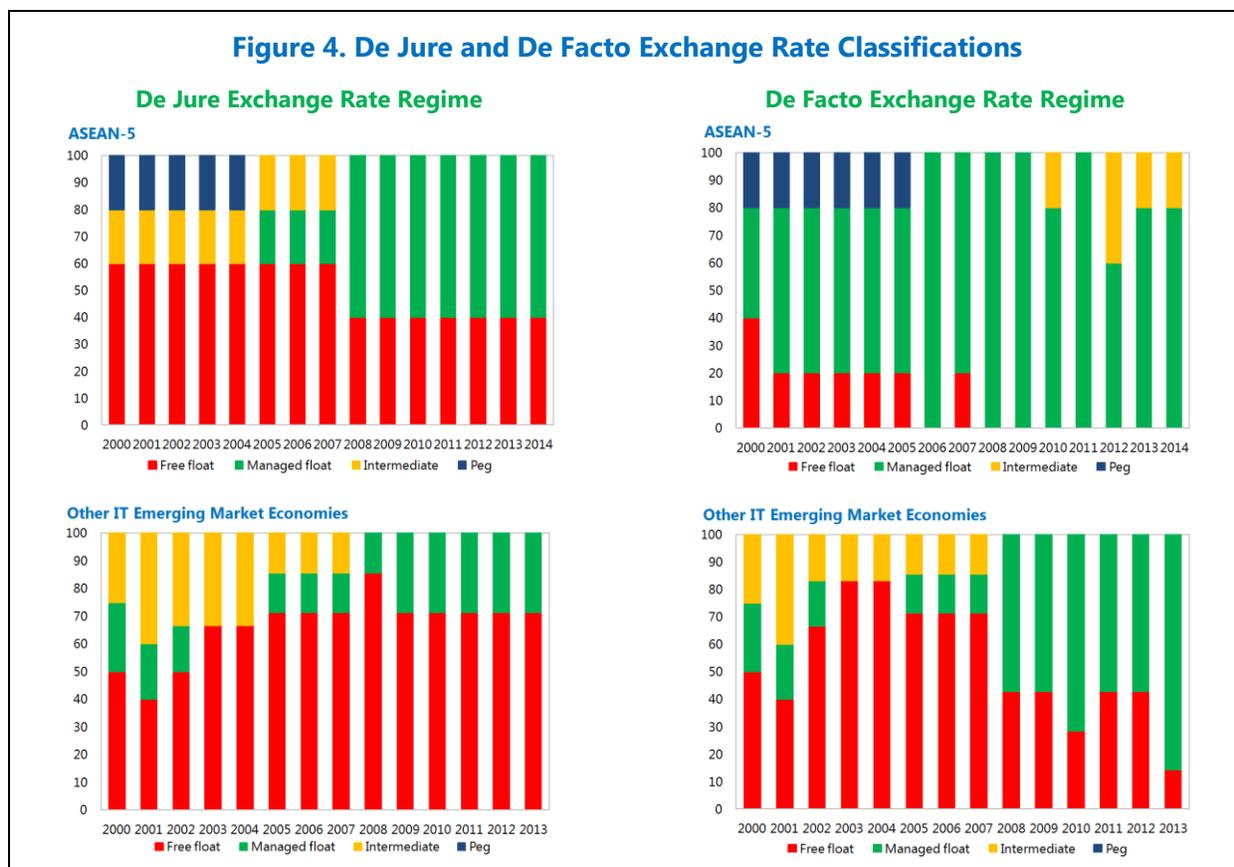
- Prior to the AFC, the Philippines had a relatively closed capital account and a managed exchange rate regime, which allowed for a fair degree of monetary policy independence. After the AFC, the Philippines gradually liberalized its capital account restrictions and continued to manage its exchange rate to build up FX reserves, reducing its independence in setting interest rates. Since the GFC, the Philippines has had a more flexible exchange rate regime, which has increased its independence in setting interest rates.
- Singapore position in the monetary policy trilemma has remained relatively unchanged. As a financial center, Singapore has a highly open capital account. It also has a unique monetary policy regime centered on the management of the exchange rate. As a result, it has limited control over the setting of interest rates, which are market determined.
- Before the AFC, Thailand had a managed exchange rate regime and an open capital account, which provided limited scope for setting interest rates. After the AFC, Thailand adopted a more flexible exchange rate regime and managed its capital account more tightly, which provided for some interest rate autonomy. Since the GFC, Thailand has allowed even more exchange rate flexibility and gained more interest rate autonomy.



**5. The move towards greater exchange rate flexibility has supported the transition to a more consistent forward-looking monetary policy framework as in other EMEs (IMF 2015b).** The Annual Report on Exchange Arrangements and Exchange Restriction (AREAER) shows a similar transition of the monetary policy and exchange rate frameworks in the ASEAN-5 countries since the early 2000s as in the trilemma triangles above. According to the AREAER classification, the ASEAN-5 economies have moved toward greater exchange rate flexibility, with all five of them classified as de jure managed or free floaters since 2008 (Figure 4).<sup>4</sup> However, this move has been less pronounced in the de facto classification, with four economies classified as managed floaters in 2014 and none

<sup>4</sup> Singapore's monetary policy framework is an exception and classified by the AREAER (2014) as an exchange rate anchor, although the MAS is ultimately targeting price stability (inflation) as main monetary policy objective.

classified as free floaters. This is not inconsistent with the experience of many AEs and EMEs that have successfully adopted IT regimes, where the move towards a floating exchange rate regime was gradual and exchange rate considerations continue(d) to play a role in the conduct of monetary policy especially during crisis periods (IMF 2015b). In fact, the number of IT EMDEs classified as de facto managed floaters has risen through time, albeit with fewer countries classified in the intermediate category. That said, the lower de facto exchange rate flexibility in the ASEAN-5 economies compared to other EMEs does warrant a closer examination to identify and understand the role of the exchange rate in the evolving monetary policy frameworks.

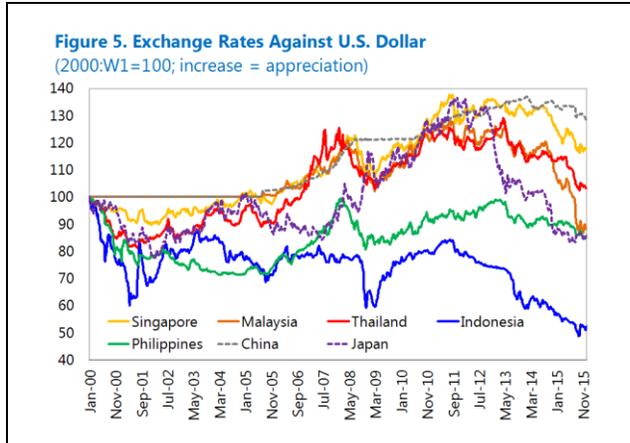


## D. Exchange Rate Behavior in ASEAN-5

**6. There does not appear to be a consistent pattern among the ASEAN-5 exchange rates.** One can notice broad co-movements among various subsets of the ASEAN-5 currencies over certain periods, which is not surprising given that they are neighbors, trading partners and competitors. At the same time, the magnitudes of exchange rate changes and the turning points differed across countries, and the groups of currencies moving together sometimes differed across periods. Thus, there is little evidence that the ASEAN-5 currencies or a subset thereof are bound together in a tight

“club” or peg to a reserve currency or basket of currencies. To more formally assess this, we test for unit roots in the exchange rates of the ASEAN-5 currencies against the U.S. dollar, the yen, and the renminbi, as well as against each another (Klyuev and Dao, forthcoming).

**7. The degree of exchange rate fixity declined over time.** Though a low power test, the hypothesis of no unit root is rejected at 5 percent significance level for a number of ASEAN-5 countries against the U.S. dollar for the pre-AFC period. This confirms the narrative of quasi-dollar-pegs in Southeast Asia before the AFC that may have contributed to the buildup in external vulnerabilities (Jeasakul and others 2014). Between the AFC and the GFC, the unit root test only picks up the ringgit quasi peg to the U.S. dollar until 2005. Finally, after the GFC, the ASEAN-5 currencies remained non-stationary against the U.S. dollar, the yen, and the renminbi, indicating the absence of a tight relationship with the U.S. dollar or any other major currency. Cointegration tests between multiple currencies broadly confirm the unit root tests results and do not show any additional statistical relationships among the exchange rates.



**8. ASEAN-5 central banks appear to smooth short-term currency volatility as stated in their FX management objectives, particularly against the U.S. dollar.** The variability of the ASEAN-5 exchange rates against the U.S. dollar increases with the time horizon (see Table 1, and Figure 6). This is consistent with the notion that the authorities try to dampen day-to-day excessive exchange rate volatility<sup>5</sup> but allow their currencies to move significantly over longer periods vis-à-vis one another and vis-à-vis any other major currency, including the U.S. dollar, the yen, and the renminbi (Klyuev and Dao, forthcoming).<sup>6</sup> The time series analyses provide no statistically significant evidence of targeting a level of the nominal and/or real effective exchange rate as well as specific anchor currencies. Multiple regression analysis following Frankel and Wei (1994), show that ASEAN-5 currency movements against third currencies largely followed those of the U.S. dollar prior to the AFC. The Singapore dollar was more closely linked to a basket of currencies in which the U.S. dollar plays a dominant role, but the yen and the euro area had a significant weight. After the AFC, the

<sup>5</sup> Which can be seen by comparing the volatility of the ASEAN-5 currencies against the U.S. dollar with their volatilities against the yen, or other freely floating currencies against the U.S. dollar.

<sup>6</sup> One cannot necessarily conclude, however, that the central banks do not resist lasting shocks and trends at all. Notably, other Asian free floaters such as the Japanese yen, Australian dollar, and New Zealand dollar have larger volatility against the U.S. dollar than the ASEAN-5 currency at every horizon. Given very limited daily movements of the RMB/US\$ exchange rate, it is also difficult to distinguish empirically between smoothing the exchange rate movements against the renminbi and against the dollar, while over longer horizons the ASEAN-5 currencies have varied considerably vis-à-vis both of these purported anchors.

**Table 1. Exchange Rate Volatility—Coefficient of Variation 1/**

	10-day			50-day			250-day		
	Pre-AFC	GFC	Post-GFC	Pre-AFC	GFC	Post-GFC	Pre-AFC	GFC	Post-GFC
ASEAN-5									
Indonesia	0.10	1.33	0.50	0.31	4.17	1.27	1.14	5.78	4.04
Malaysia	0.23	0.62	0.54	0.61	1.77	1.25	1.76	3.79	2.89
Philippines	0.24	0.75	0.39	0.78	1.87	0.88	3.09	5.60	1.91
Singapore	0.24	0.73	0.39	0.60	1.90	0.90	1.69	3.28	2.23
Thailand	0.18	0.43	0.33	0.40	1.01	0.87	0.79	4.34	2.15
Other Asian free-floaters									
Australia	0.51	2.45	0.85	1.14	5.91	1.97	2.55	11.69	5.43
New Zealand	0.42	2.20	0.92	0.95	5.09	2.08	2.44	10.76	5.07
Japan	0.71	1.28	0.67	1.73	2.75	1.51	4.55	4.63	4.08

1/ Time periods: Pre-AFC (1991-June 1997); GFC (September 2008-February 2009); and Post-GFC (March 2009 to latest data).

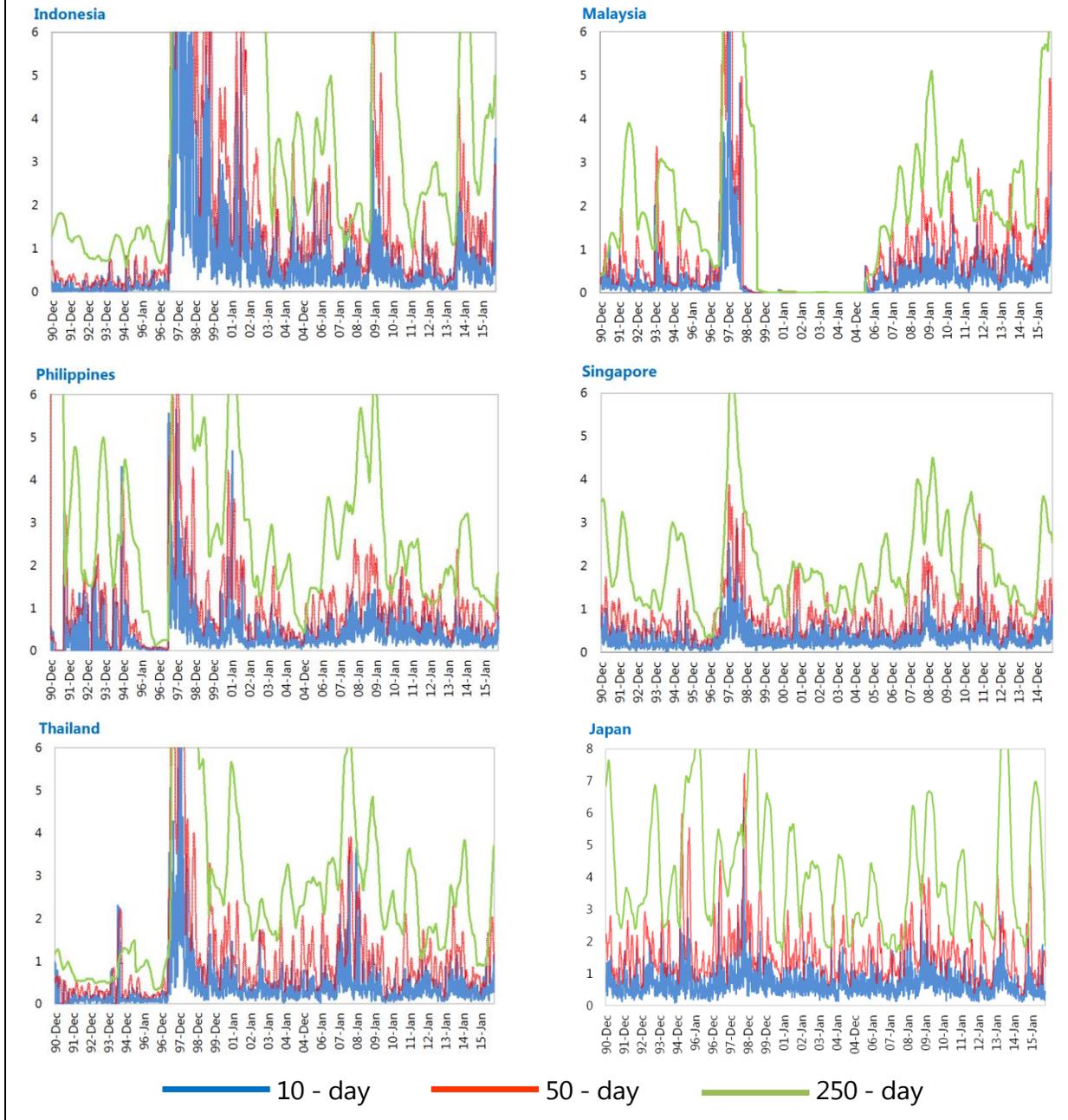
Indonesian rupiah became considerably more volatile, while at the opposite end of the spectrum the Malaysian ringgit was pegged to the U.S. dollar until 2005. Thailand's baht appears to have shifted some weight to the yen, with the dollar still by far the most significant anchor, and to have increased slightly the degree of flexibility. The peso was broadly on an appreciating trend against a combination of the U.S. dollar and the yen post-AFC, but exhibited greater volatility through time. After the ringgit peg with the U.S. dollar was broken, the ringgit moved more freely. Perhaps surprisingly, only a slight increase in the ASEAN-5 exchange rate volatility against the U.S. dollar can be observed in the years following the GFC compared to the pre-GFC period. This suggests that the ASEAN-5 central banks might have sought to counter the increasingly volatile environment associated with unconventional monetary policies in advanced economies with an increasing amount of FX intervention.

## GLOBAL FINANCIAL CYCLE AND SPILLOVERS

### A. Global Financial Cycle and Domestic Financial Conditions

**9. Global financial cycles and volatility spillovers pose a challenge for the ASEAN-5 countries.** Eichengreen and Gupta (2014) argue that a key determinant of the severity of the impact of tapering talks is the volume of prior capital inflows. Rey (2013) argues that there is a global financial cycle in capital flows, asset prices, and credit growth, and that the cycle (proxied by VIX) is mainly driven by the U.S. monetary policy—affecting leverage of global banks, and cross-border capital/credit flows. Potential surprises from U.S. interest rate normalization and spikes in global risk aversion could be accompanied with capital outflows and tightening of domestic financial conditions that would have significant macrofinancial effects on the ASEAN-5 countries. Quantifying the impact and identifying the macrofinancial transmission channels are important to understand the role of monetary policy and potential for amplification of shocks.

**Figure 6. Coefficient of Variation of Exchange Rates Against U.S. Dollar at Different Horizons**



**10. Domestic financial conditions in the ASEAN-5 economies are sensitive to global factors.** Following the approach of Miranda-Agrippino and Rey (2012), we estimate a principal component model to identify the underlying global factors that can explain the variability of a

comprehensive set of domestic financial indicators.<sup>7</sup> The principal component analysis shows that the first two common components explain about 60–75 percent of the variation of domestic financial conditions in the ASEAN-5 economies, with the exception of Singapore where the first principal component explains most of the variation. In general, in each economy, one of the first two principal components associated with the U.S. 10-year treasury bond are closely related to long term bond yields, retail bank interest rates, bank credit, and corporate sector indicators, while the other component associated with the VIX is correlated more closely with short term market rates, the exchange rate and stock market indicators (see Figure 7 and Table 2).<sup>8</sup> More specifically, in the ASEAN-5 economies, there are two key macrofinancial transmission channels of global financial shocks: one related to the VIX and global financial cycle as in Blanchard and others (2015) that impact capital flows and asset prices; and another linked to U.S. interest rates that affects monetary and credit conditions.

## B. Interest Rate Spillovers

**11. While the role of global risk aversion on EMEs' asset prices has been well studied, there is a need to take a closer look at spillovers on ASEAN-5's domestic interest rates given their direct implications on the monetary policy framework.** How the “center economy” monetary policies are transmitted to domestic long-term sovereign bond yields is of particular interest as they act as a benchmark for pricing corporate bonds and household mortgages. The influence of global financial factors and risk aversion on domestic retail bank rates, directly or indirectly, through the monetary transmission mechanism is also important given the dominance of banks in the ASEAN-5 economies.

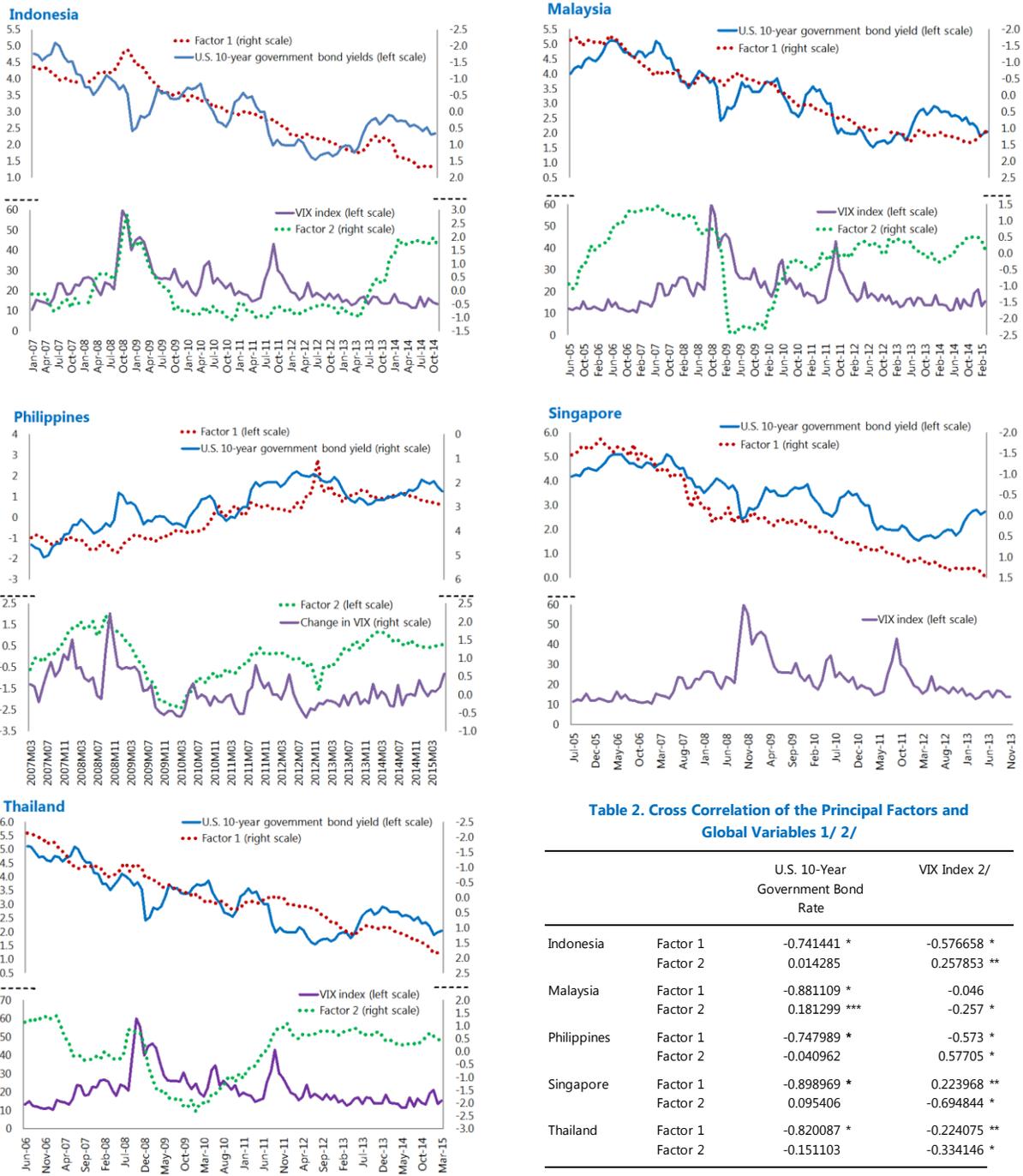
- *Domestic long-term market interest rates.* The methodology followed Peiris (2013), estimating an EGARCH (1,1) model of sovereign bond yields in the ASEAN-5 economies during 2000–2015 using a comprehensive set of macrofinancial variables including global factors. The results show that a decline in the shadow federal funds rate<sup>9</sup> reduces long-term government bond yields in

<sup>7</sup> The domestic financial factors included about 40–60 financial variables for each economy used to estimate Financial Conditions Index in (FCIs) in Asia (IMF, 2015c). Adding or excluding different types of capital flows did not significantly affect the results.

<sup>8</sup> The second principal component or factor in Indonesia and the Philippines are more closely related to the exchange rate that shows a negative correlation with the VIX while in the other three countries it is associated with equity prices.

<sup>9</sup> The Federal funds rate provides the conventional measure of U.S. monetary policy stance but at a near-zero rate since the end of 2008 cannot capture the role of unconventional monetary policy. This prompts the consideration of other measures including a shadow short rate (Krippner, 2014). The shadow short rate is computed using estimates from a two-state variable shadow yield curve and has historically tracked the actual federal funds rate very closely, prior to reaching the zero lower bound.

**Figure 7. Co-movement of Latent Factors with Global Factors**



**Table 2. Cross Correlation of the Principal Factors and Global Variables 1/ 2/**

		U.S. 10-Year Government Bond Rate	VIX Index 2/
Indonesia	Factor 1	-0.741441 *	-0.576658 *
	Factor 2	0.014285	0.257853 **
Malaysia	Factor 1	-0.881109 *	-0.046
	Factor 2	0.181299 ***	-0.257 *
Philippines	Factor 1	-0.747989 *	-0.573 *
	Factor 2	-0.040962	0.57705 *
Singapore	Factor 1	-0.898969 *	0.223968 **
	Factor 2	0.095406	-0.694844 *
Thailand	Factor 1	-0.820087 *	-0.224075 **
	Factor 2	-0.151103	-0.334146 *

1/ \*\*\*significant at p<0.10; \*\*significant at p<.05; \*significant at p<0.01.  
 2/ The VIX coefficient for the Philippines refer to change in VIX rather than the VIX index, given the factor's stronger association with the former.

Sources: IMF; CEIC Data Co., Ltd.; Haver Analytics; Bloomberg L.P.; and IMF staff estimates.

1/ \*\*\*significant at p<0.10; \*\*significant at p<.05; \*significant at p<0.01.

2/ The VIX coefficient for the Philippines refer to change in VIX rather than the VIX index, given the factor's stronger association with the former.

all ASEAN-5 economies. An increase in U.S. term premium, such as during the “taper tantrum”, also results in higher long-term bond yields in all ASEAN-5 economies. The results indicate that a rise in the shadow federal funds rate and U.S. term premium could have a greater impact on Indonesia and the Philippines. Greater global risk aversion proxied by the VIX has a mixed effect on long rates, with a rise in the VIX increasing yields in Indonesia and the Philippines while lowering yields in Thailand, probably reflecting the greater home bias of Thai financial institutions. Robust fundamentals such as stronger current account balances and lower public debt tend to keep bond yields down. Expectations of currency depreciation can also drive bond yields higher. Interestingly, better growth expectations often result in lower bond yields than vice versa, suggesting that investors may see better growth prospects as a sign of improved credit worthiness rather than just a cyclical consideration. Overall, the susceptibility of long-term bond yields to global factors is consistent with the high degree of foreign participation in the ASEAN-5 economies, with foreign portfolio capital flows being a key channel of spillovers, albeit with expectations and domestic residents continuing to play a significant role.<sup>10</sup>

**Table 3. Determinants of Sovereign Bond Yields 1/ 2/**  
(10-year government bond)

	Domestic Factors				External Factors				
	Debt to GDP ratio	Expected GDP	Inflation	Current account balance in percent of GDP (-1)	Expected exchange rates (1-year forecast)	Share of foreign holdings in total LCY government bonds	VIX	Shadow Federal funds rate	U.S. term premium
Indonesia	0.042629 -0.026855	-1.580214 *** -0.711379 *	0.224828 *** 0.231493 ***	0.093751			0.050833 ** 0.045873 ***	0.256726 *** 0.207543 ***	0.716516 *** 0.69498 ***
Malaysia	0.002688 0.00418	-0.141494 * 0.012942	0.054183 ** 0.042216	-0.018823	0.387852	-0.002034	0.000229 0.0000795	0.076478 *** 0.030623	0.188854 *** 0.178108 **
Philippines	0.070096 ** 0.030954	-0.93981 *** -1.150746 ***	0.091955 0.148232 **	-0.11592 *		-0.14362 ***	0.015583 0.027005 *	0.282424 *** 0.348581 ***	0.377099 ** 0.224802 **
Singapore	-0.001078 -0.000881	-0.06179 -0.056548	-0.004983 -0.046091 **	0.006988			-0.007334 0.007166	0.15361 *** 0.14116 ***	0.221407 *** 0.263296 ***
Thailand	-0.092427 * -0.147288 ***	0.028645 -0.102066	0.098888 ** 0.118716 ***	-0.028399 *	0.075183 ***	0.012005	-0.022071 * -0.024512 **	0.089696 ** 0.034472	0.210694 ** 0.178285 ***

1/ \*\*\* significant at .01 level; \*\*significant at .05 level; \*significant at .10 level.

2/ The coefficients reflect the marginal increase in interest rates in percent of a 1 percentage point rise in the explanatory variables.

- *Retail bank rates.* Spillovers of global factors to retail bank rates in the ASEAN-5 countries were investigated following the approach of Ricci and Shi (2016) by estimating the domestic and global determinants of both deposit and loan rates.<sup>11</sup> In addition, the specification allows for

<sup>10</sup> The degree of foreign participation has a direct impact on sovereign bond yields in the ASEAN-5 as in other EMs (see Peiris, 2013 and IMF, 2009) while the role of global financial factors also remain significant. The impact of Quantitative Easing in the Euro Area and Japan was not distinguishable with U.S. financial variables which are the dominant global factor for the ASEAN-5. The increasing spillovers from China to EME financial markets reported in IMF (2016b) were also not discernible in the quarterly data from 2000–15 given the frequency of the sample.

<sup>11</sup> The empirical methodology followed Ricci and Shi (2016) in assessing the robustness of the findings to alternative specifications and sub-sample estimations, but the results were largely unchanged from the Ordinary Least Squares estimates below for the full sample period, allaying concerns of omitted variable bias and/or structural breaks. The robustness of the results to alternative publicly available retail bank rate data were also tested, although supervisory data on banks deposit and loan rates were unavailable and may provide a more accurate measure of financing costs.

liquidity effects and rigidities in interest rate transmission. The results indicate that global financial factors significantly affect bank behavior in the ASEAN-5 economies except possibly in the case of Thailand.<sup>12</sup> However, the domestic policy rate and liquidity conditions (measured by the deviation of reserve money from a Hodrik-Presscot trend) also matter, affirming the important role of domestic monetary policy and liquidity management operations in influencing the credit cycle.

**Table 4. Determinants of Deposit Rates 1/ 2/**

	Domestic Factors			External Factors		
	Policy rate	Reserve money gap	Deposit interest rate (-1)	VIX	Federal funds rate	U.S. term premium
Indonesia	0.029085 * 0.147722 ***	-0.00000515 -0.00000331 **	0.931956 ***	-0.001099 -0.010371 **	0.009085 0.39781 ***	0.031518 0.623272 ***
Malaysia	0.034628 *** 0.056984	-0.00000819 0.0000124 ***	0.935265 ***	-0.001194 *** -0.003314*	0.002909 0.093482 ***	0.010076 ** 0.075773 ***
Philippines	0.087721 * 0.794831 ***	-0.00000347 -0.00000284 ***	0.873285 ***	0.000755 -0.005019	-0.012197 -0.114371 **	0.034243 0.274831 ***
Singapore	0.001507 0.020551 ***	0.00000029 -0.00000035	0.937824	0.0000563 *** 0.001726 ***	0.00125 0.020946 ***	-0.000491 0.013999 ***
Thailand	0.046608 * 0.317694 ***	0.000158 -0.0000239	0.881762 ***	-0.002467 -0.010069 ***	0.002499 0.074641 ***	0.013047 0.038719

1/ Short-term interest rate (SIBOR, 3 months) was used for the Singapore's policy rate variable. \*\*\* significant at .01 level; \*\*significant at .05 level; \*significant at .10 level.

2/ The coefficients reflect the marginal increase in interest rates in percent of a 1 percentage point rise in the explanatory variables.

**Table 5. Determinants of Lending Rates 1/ 2/**

	Domestic Factors			External Factors		
	Policy rate	Reserve money gap	Lending interest rate (-1)	VIX	Federal funds rate	U.S. term premium
Indonesia	0.071949 *** 0.100323	-0.00000037 -0.00000867 ***	0.952197 ***	0.001855 0.010488	-0.015185 0.688684 ***	0.00625 0.970761 ***
Malaysia	0.01626 0.040728	0.00000116 0.0000139 ***	0.913686 ***	-0.001385 0.009755 ***	0.033509 *** 0.380285 ***	0.024631 ** 0.232558 ***
Philippines	0.305045 *** 1.053698 ***	-0.00000036 -0.00000245 **	0.692695 ***	0.007808 0.021974 ***	0.030319 0.070293	0.228821 *** 0.78514 ***
Singapore	-0.003308 -0.029163 ***	-0.000000474 ** -0.00000134 **	0.927270 ***	0.0000614 0.000581 ***	0.001591 0.005802 **	0.001380 0.008991 ***
Thailand	0.148981 *** 0.692007 ***	-0.000034 -0.001009**	0.811153 ***	-0.003455 *** 0.000294	-0.042286 *** -0.218023 ***	0.003074 -0.118202 ***

1/ Short-term interest rate (SIBOR, 3 months) was used for the Singapore's policy rate variable. \*\*\* significant at .01 level; \*\*significant at .05 level; \*significant at .10 level.

2/ The coefficients reflect the marginal increase in interest rates in percent of a 1 percentage point rise in the explanatory variables.

<sup>12</sup>The increase of provisioning rates by the Bank of Thailand and tightening of banks' lending standards probably related to rising household leverage (see next section) may explain the different results for Thailand.

**12. An active operational framework that aligns market conditions with the announced policy stance have helped to maintain the effectiveness of policy rate transmission in most periods despite the rising sensitivity to global factors.** Central bank operations in the ASEAN-5 economies have generally aligned market rates with the announced interest rate corridor (see Figure 8), except in the case of Philippines where, until recently, short-term money market rates were much lower than the policy rate corridor reflecting the difficulty that the BSP encountered in mopping up excess liquidity deriving from the surge in capital inflows during 2009–2011 given the limited instruments at its disposal.<sup>13</sup> In Indonesia’s case, the overnight interbank rate was effectively at the bottom of the policy interest rate corridor again reflecting the challenges that Bank Indonesia had in ramping up open market operations with limited instruments in the context of UMPs in AEs. An effectively implemented monetary operation framework supports the functioning of money markets, allowing banks to predictably place surplus liquidity with, and obtain short-term funding from each other or the central bank at rates that are related to the policy rates. The continued significance of policy rates and liquidity conditions in determining retail bank rates highlight the importance of active liquidity management in a world of excess global liquidity.

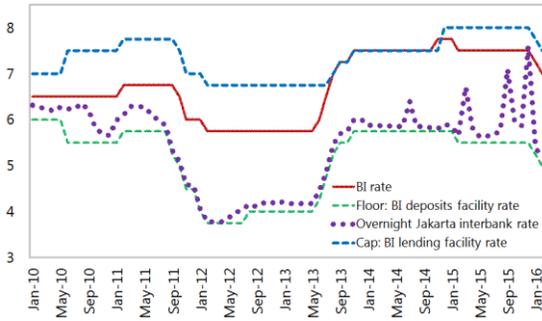
**13. Managing the global financial cycle is a key challenge for ASEAN-5 monetary frameworks.** The results above suggest the existence of a global financial cycle emanating from changes in U.S. monetary policy and global risk aversion that drives domestic financial conditions in the ASEAN-5 economies. The results are consistent with the findings of IMF (2014c) that show a high sensitivity of EME asset prices to global financial conditions. Our findings extend this literature by showing that the sensitivity to global factors extend to retail bank rates as in Ricci and Shi (2016), the main channel of monetary transmission in the ASEAN-5 economies. This puts the traditional “trilemma” view of the independence of monetary policy with flexible exchange rate into question as flexible exchange rate alone is unable to fully insulate economies from the global financial cycle, when capital account is highly open and financial flows are driven by monetary conditions in the U.S. and can be highly volatile (Rey 2013). In addition, the transmission of global financial factors through domestic asset prices suggests a potential amplification of global financial cycles through “financial accelerator” effects on the real economy that would be important to take into account.<sup>14</sup> IMF (2014c) shows that financial deepening lowers the sensitivity of EME equity and bond prices to global financial factors; the results for the foreign exchange market are somewhat weaker. That said, generalized reductions in global interest rates and loose liquidity conditions have increased the risk

<sup>13</sup> The BSP has announced the introduction of an interest rate corridor system by second quarter of 2016 and the use of deposit auctions to undertake active open market operation and better anchor short-term market rates.

<sup>14</sup> See IMF (2015g) for the empirical transmission of the VIX and U.S. 10-year treasury bond yields on private credit growth and domestic demand through capital flows and asset prices in the Philippines. While domestic credit and demand has been impacted by global financial factors and amplified through “financial accelerator” effects controlling for the global business cycle, domestic policy rates continued to have a significant influence through a credit and exchange rate channel.

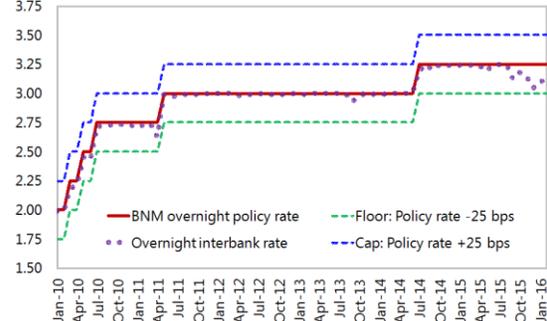
**Figure 8. Policy and Market Interest Rates**

**Indonesia: Policy and Interbank Rates**  
(In percent)



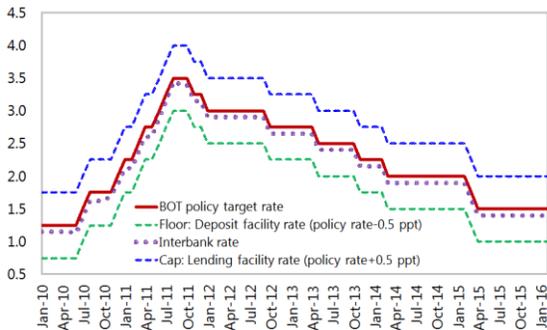
Sources: Haver Analytics; and CEIC Data Co., Ltd.

**Malaysia: Policy and Interbank Rates**  
(In percent)



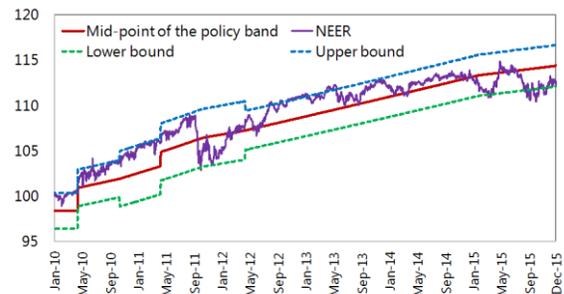
Sources: Haver Analytics; and CEIC Data Co., Ltd.

**Thailand: Policy and Interbank Rates**  
(In percent)



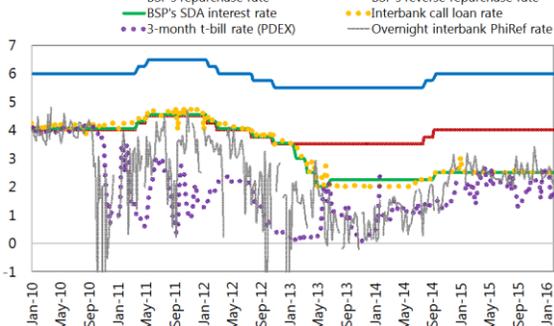
Sources: Haver Analytics; and CEIC Data Co., Ltd.

**Singapore: NEER and Policy Band 1/**  
(Jan 1, 2010=100)



Source: IMF, Information Notice System; and IMF staff estimates.  
1/ Mid-point, lower and upper bounds of the policy band are staff estimates.

**Philippines: Policy Rates, Interbank and T-Bill Rates**  
(In percent)



Sources: Bloomberg LP; Haver Analytics; and Philippine Dealing and Exchange Corp. (PDEX).

of asset price and credit boom and bust cycles in Asia (see Gupta and others, 2010), raising financial stability concerns and disorderly adjustment to sudden stops in capital inflows. In this light, the next section will assess the effectiveness of traditional monetary policy, as well as the role of MPPs in maintaining financial stability (IMF 2014a), and CFMs/FX intervention and exchange rate flexibility in managing volatile capital flows in the ASEAN-5 economies.

## POLICY RESPONSES

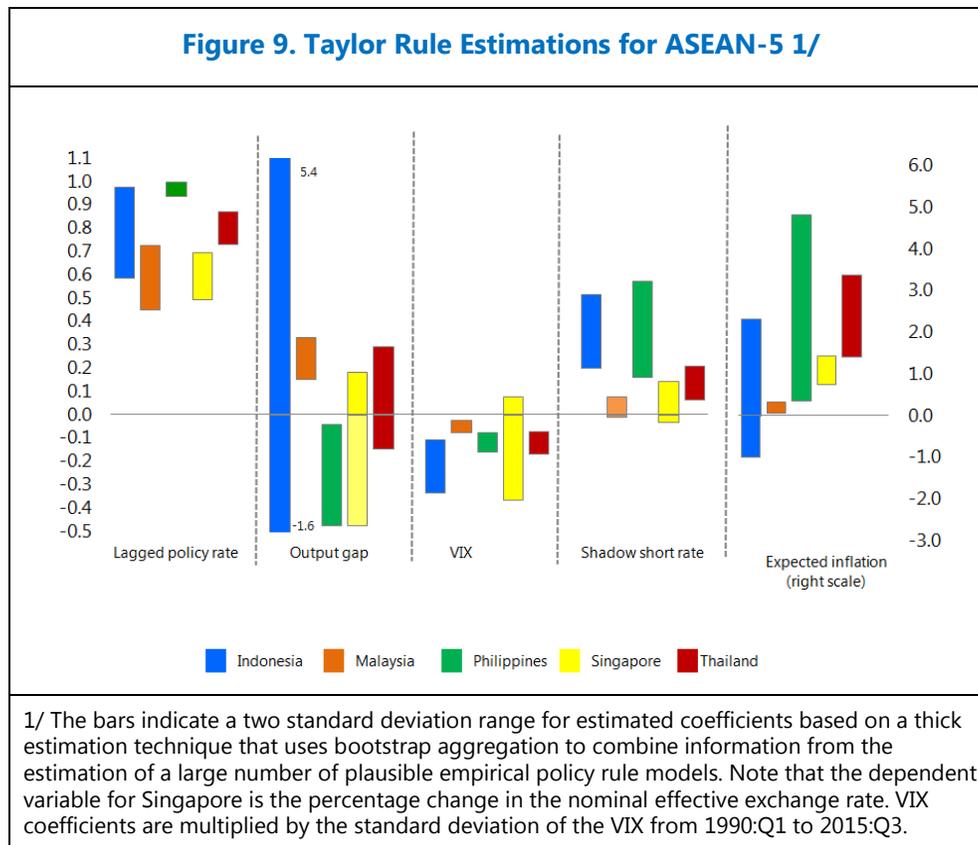
### A. Monetary Policy

**14. Estimates of Taylor rule reaction functions are used to gauge monetary policy responses and drivers** (see Appendix II). The standard Taylor rule uses the output gap and inflation (or deviation from its target) to describe policy interest rate settings. In the case of Singapore, the rule is modified to reflect the use of the nominal effective exchange rate as the main instrument for monetary policy.<sup>15</sup> Augmentation of the Taylor rule permits analysis of the relevance of other variables such as the exchange rate, U.S. interest rates, and global uncertainty in monetary policy settings in the ASEAN-5 economies. This paper uses thick estimation techniques that avoid the selection of a single equation and instead involves estimation of all plausible combinations of potential explanatory variables (Granger and Jeon, 2004). The approach thus provides insights as to whether a variable of interest generally guides decisions rather than its significance in one single equation.

**15. The Taylor rule estimations fit the data well and provide valuable insights on policy directions.**<sup>16</sup> The lagged dependent variable plays a large role with a coefficient of 0.6 in Malaysia and close to 1.0 in the Philippines indicating a strong preference for interest rate smoothing. The analysis confirms the role of expected inflation in guiding policy rate settings in all countries with the coefficient estimates on expected inflation exceeding those on either inflation or core inflation. The inflation rate has the greatest relevance in Thailand, with statistically significant coefficients on average for all three variables and coefficient value in excess of 1 in response to increases in either core or expected inflation. On the other hand, Malaysia—a non-inflation targeter—appears least responsive to changes in inflation. The output gap is insignificant except in the case of Malaysia, where a negative output gap of 1 percentage point is associated with a 25 basis point reduction in the policy interest rate. This finding, along with the results on the inflation rate, points to a greater emphasis on output and employment rather than inflation in Malaysia.

<sup>15</sup> See for example, McCallum (2006), Parrado (2004) and MAS (2013).

<sup>16</sup> Appendix II provides detailed discussion of the empirical results.

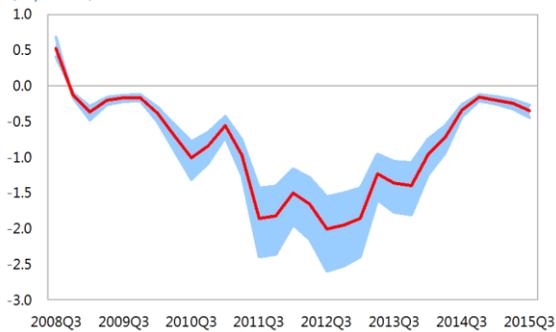


**16. Nontraditional factors also play a role in the ASEAN-5 economies.** In previous studies, the exchange rate has been found to have an impact on the monetary policy decisions even in EMEs with IT regimes (Ostry and others, 2012). The coefficient estimates are on aggregate insignificant, suggesting little role the exchange rate played in setting the policy interest rate in the ASEAN countries. Looking at the possible role of global shocks, a dummy variable for the global financial crisis is statistically significant with a large negative sign, ranging between 30 bps for Malaysia to 75 bps for Indonesia, and captures the role of external factor in affecting policy rates. Alternatively, the VIX was found to be statistically significant and suggests that a 30 point increase in the VIX (e.g., as in September 2011) has been associated with a decline in policy rates of 10–45 bps.

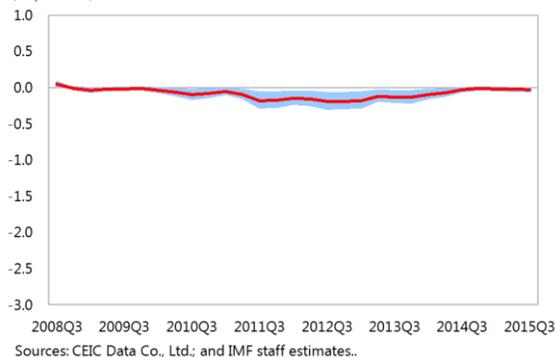
**17. The role of U.S. interest rates in policy reaction functions are explored in more detail given the finding of U.S. interest rate spillovers on domestic financial conditions.** Higher U.S. short-term interest rates are generally associated with higher policy rates in the ASEAN-5 countries, and this is the case for both the federal funds rate as well as the shadow-short term rate. The results suggested that U.S. shadow interest rates associated with UMPs have put significant downward pressure on policy interest rates in the ASEAN-5 economies (Figure 10). That said, there appears to be some heterogeneity in the response, with the estimated impact smaller in the more financially developed markets of Malaysia and Singapore, that may be better able to insulate asset markets from volatile capital flows. This deviation from more traditional Taylor rule implied policy rates in the ASEAN-5 countries suggests a potential structural break (Hofmann and Bogdanova, 2012) to a “new normal.”

**Figure 10. Impact of U.S. Monetary Policy 1/**

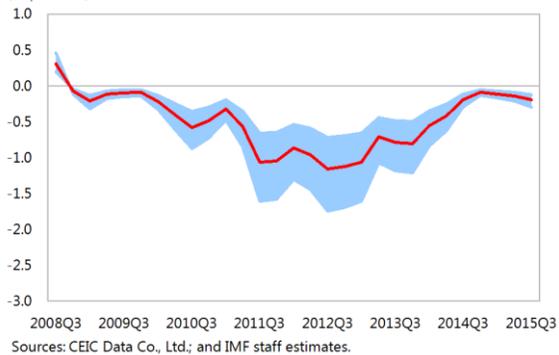
**Indonesia**  
(In percent)



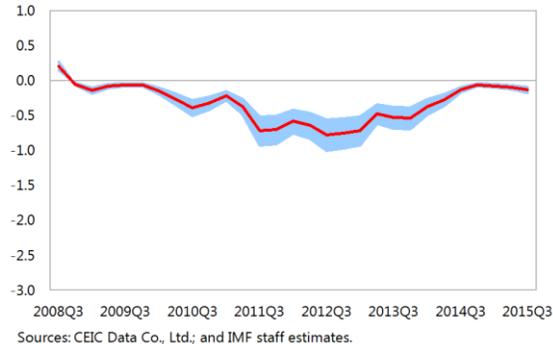
**Malaysia**  
(In percent)



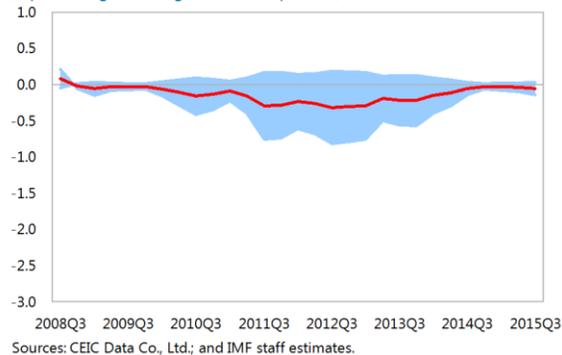
**Philippines**  
(In percent)



**Thailand**  
(In percent)



**Singapore**  
(Implied marginal change in NEER, in percent)



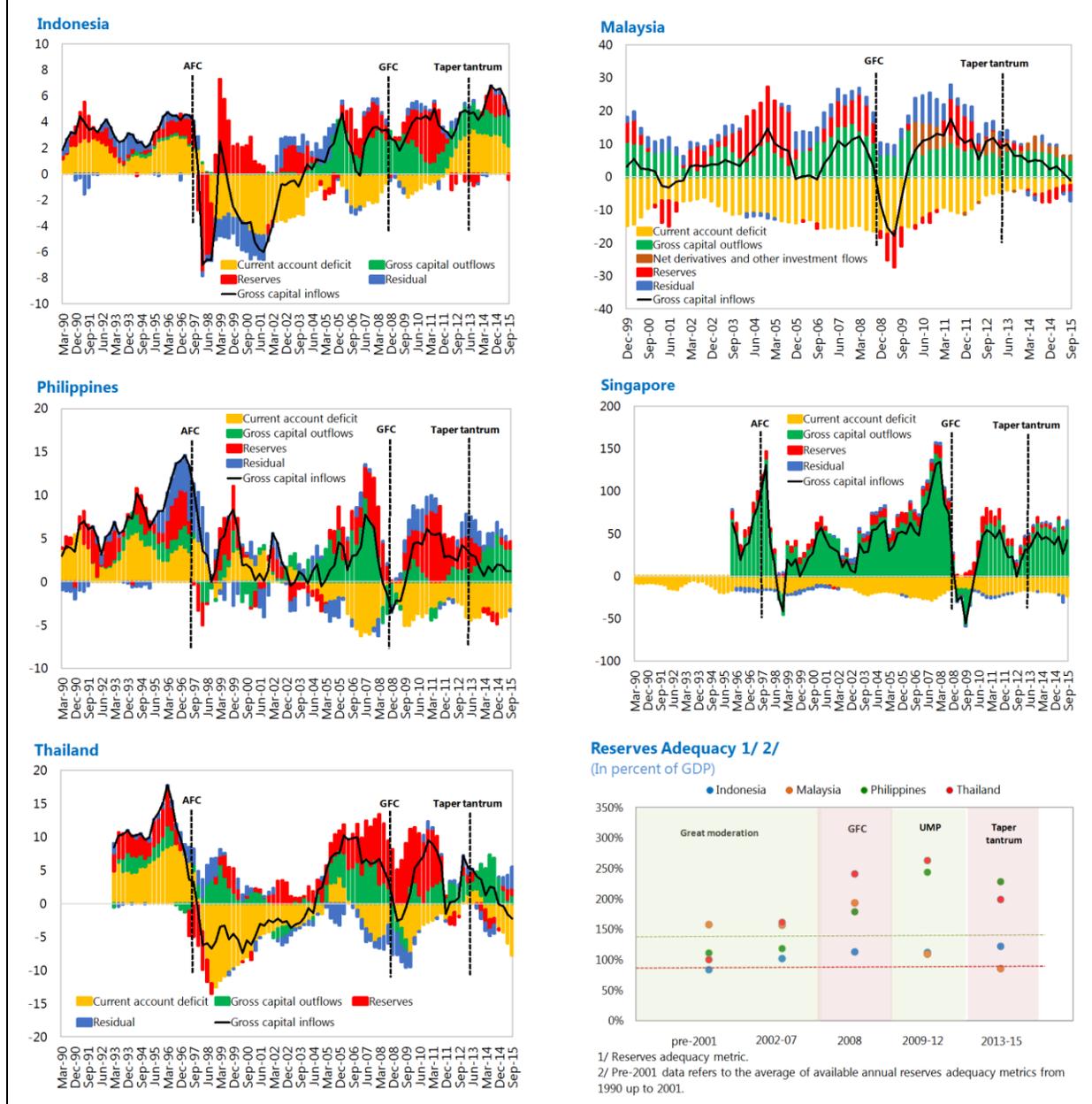
1/ The impact of U.S. interest rates depicted is the coefficient (marginal impact) on the shadow U.S. interest rate in the regression multiplied by the change in the shadow U.S. rate in the period, giving a measure of the implied change in policy rates.

## B. The Global Financial Cycle and External Adjustment

**18. Gross capital outflows have smoothed the adjustment to the global financial cycle while reserves have played an important buffer role** (IMF 2016a). Behind the global financial cycle, the contributions from capital inflows and outflows vary sizably over time in the ASEAN-5 economies. IMF (2013d) argues that EMEs can improve the management of the global capital flow cycle through development of their financial markets, which fosters private sector outflows during nonresident inflow episodes that can help stabilize net capital flows.<sup>17</sup> In addition, the buildup and use of a reserve buffer can help counteract capital outflow episodes in EMEs as observed in 2010–15 (IMF 2016a). The motivation for the accumulation of reserves in the ASEAN-5 economies was based on their experience during the AFC and perceived benefits of building an adequate reserve buffer to shield the economy from the liquidity effects of volatile capital flows. Reserve levels were in some cases below or at the lower bound of the Fund reserve adequacy metric range at the beginning of the great moderation but were gradually built up to comfortable levels prior to the GFC (see Figure 11). At the same time, they moved towards a more flexible exchange rate regime to enhance monetary policy autonomy (see “trilemma” triangles in Section I) and role of the exchange rate as a shock absorber (see below) in line with Fund policy positions. Malaysia is one of the EMEs with deep financial markets which were able to intermediate most of the inflows through financial institutions investments abroad (Figure 11). The accumulation of reserves during periods of large gross capital inflows in 2002–2007 and in 2009–2011 was mainly on account of the large current surpluses and the short-term capital inflows which were mopped up by Bank Negara bills to shield the financial system from its liquidity impact and eventual outflow. During periods of large gross capital outflows and declining gross capital inflows in 2008–2009 and 2013–2015, Bank Negara ran down its FX reserves and stock of Bank Negara bills to accommodate the outflows alongside exchange rate depreciation in order to buffer the shock on the economy. As a result, the current account remained in surplus during the whole period (although less so in the recent period due to the decline in commodity prices). Indonesia, the Philippines, and Thailand ran current account deficits in response to large gross capital inflows in the pre-AFC period, but managed to isolate the current account from fluctuations in gross capital inflows thanks to counteracting gross capital outflows and reserve accumulation in 2003–2007, and mainly through reserve accumulation in the UMP period (2010–2012). For Singapore, most of the variation in gross capital inflows is offset by similar variations in gross capital outflows, with little action in the current account or reserve accumulation, as would be expected from a financial center.

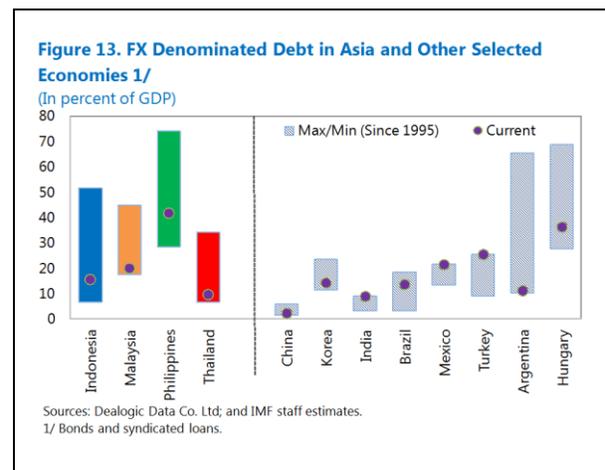
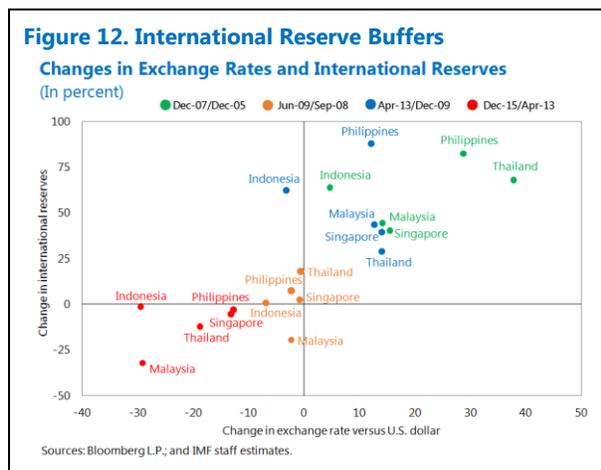
<sup>17</sup> Yet over 2013–15, outflows exacerbated the decline in net inflows in the ASEAN-5, suggesting that a potentially destabilizing role cannot be ruled out as in other EMs during a similar period (IMF, 2016)

**Figure 11. Global Financial Cycle: Financial and Real Adjustment in ASEAN-5**  
(In percent of GDP)



**19. Since 2013, gross capital inflows have moderated, and the ASEAN-5 economies have reduced the pace of reserve accumulation or decumulated as in other EMEs** (Figure 12 and IMF 2016a). The fact that reserve accumulation slowed down in tandem with diminished capital inflows (or turned into reserve losses in some countries seeing outflows) also has a positive side: by facilitating the repayment of residents’ foreign-currency liabilities, the sale of foreign assets could reduce balance sheet fragilities coupled with the growing ability to issue debt denominated in local currency in the ASEAN-5 economies (see Figure 13). With strengthened domestic balance sheets, a currency depreciation can play its traditional role of smoothing adjustment to external shocks. In

fact, the ASEAN-5 relied more on currency depreciation than reserves changes in 2013–15 compared to previous inflow and outflow episodes (see Figure 12 and Appendix III). This also meant that the ASEAN-5 economies’ external gaps based on the External Balance Assessment (EBA) approach of the Fund narrowed over the two global financial cycles and were largely closed during the outflow episodes.<sup>18</sup> The greater exchange rate flexibility in the ASEAN-5 economies documented in Section I may also have mitigated the slowdown in capital inflows as shown in IMF (2016a) where more flexible exchange rate regimes reduce the share of the total variance in capital inflows explained by common global factors.<sup>19</sup> In general, the reserve buffers built up during the great moderation and UMP period were drawn down, in some cases close to the lower bound of the Fund’s reserve adequacy metric range (Indonesia and Malaysia), albeit with the Philippines and Thailand continuing to maintain reserves above the range, indicating a self insurance motive that goes beyond levels implied by cross country experiences in some cases. This may be seen as an endogenous response to the experience of the AFC. In such a case, it would also be important to consider the tradeoff between self-insurance and the cost of holding reserves.



**20. The ASEAN-5 countries are not among those with the highest degree of FX intervention, except for Singapore** (Figure 14).<sup>20</sup> Indonesia’s degree of exchange rate management is the lowest and is comparable to that of some advanced economies, like Japan. Philippines and Thailand follow, with slightly higher degree of exchange rate management. Malaysia

<sup>18</sup> The persistence of the EBA external gap residuals in some cases, such as the Philippines, could reflect a number of structural factors not included in the EBA analysis as explained in the Article IV consultation reports.

<sup>19</sup> IMF (2016a) also shows that countries that have higher reserves and lower public debt as in the ASEAN-5(see Appendix III) tend to have a lower percentage of the fluctuations in their capital inflows attributable to global factors, which may explain some of the resilience to the capital outflow episodes.

<sup>20</sup> While there is no perfect measure of the degree of FX intervention in the literature, the results of the approach of Adler and Mano (2016) presented here is consistent with more traditional measures in (IMF 2015a).

is around the median of the sample between Russia and Argentina. Finally, Singapore has a very high degree of exchange rate management, comparable to that of China, which is not surprising given its exchange rate based approach of IT.

## 21. ASEAN-5 central banks have generally sterilized their FX intervention.

To measure the intensity of sterilization in the ASEAN-5 economies, a sterilization coefficient ( $\beta$ ) is estimated following the approach of Aizenman and Glick (2008). This coefficient is estimated

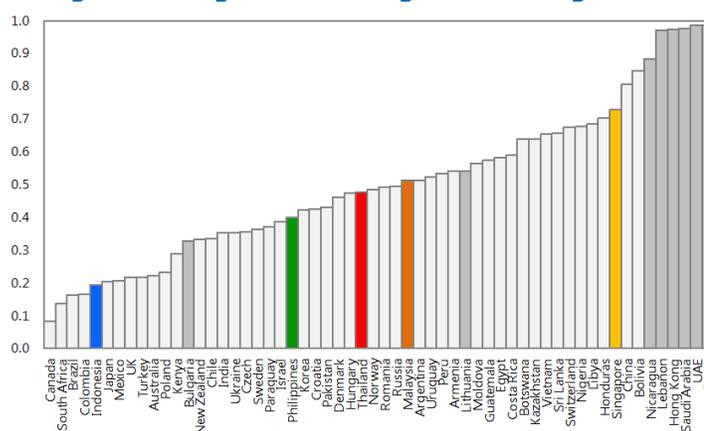
using one month extended and

60-month rolling windows, where  $\beta = -1$  represents full sterilization of reserve changes;  $\beta = 0$  implies no sterilization; and  $-1 < \beta < 0$ , indicates partial sterilization. Average sterilization coefficients in the ASEAN-5 economies have remained close to  $\beta = -1$  in the post-AFC period (Figure 15 and Table 6). In general, the ASEAN-5 countries have attempted to fully sterilize their FX intervention even during the UMP period (albeit with temporary periods of partial sterilization in Indonesia, Malaysia and the Philippines) when the accumulation of foreign reserves was especially strong and sterilization may have attracted greater capital inflows.

## 22. The benefits of holding reserve buffers need to be weighed against its costs.<sup>21</sup>

The marginal opportunity cost of reserve buffers can be estimated as the cost of rolling over FX positions and thus equates to departures from uncovered interest parity (UIP) following Adler and Mano (2016).<sup>22</sup> In the sample considered, the ex-post marginal costs of FX intervention, as represented by departures from UIP, have been sizeable. From a policy perspective, however, ex-post marginal costs are not a relevant consideration because central banks cannot anticipate unexpected shocks that may move costs significantly when deciding whether to intervene in FX markets. Adler and Mano (2016), estimate more policy relevant ex-ante costs or expected UIP

Figure 14. Degree of Exchange Rate Management

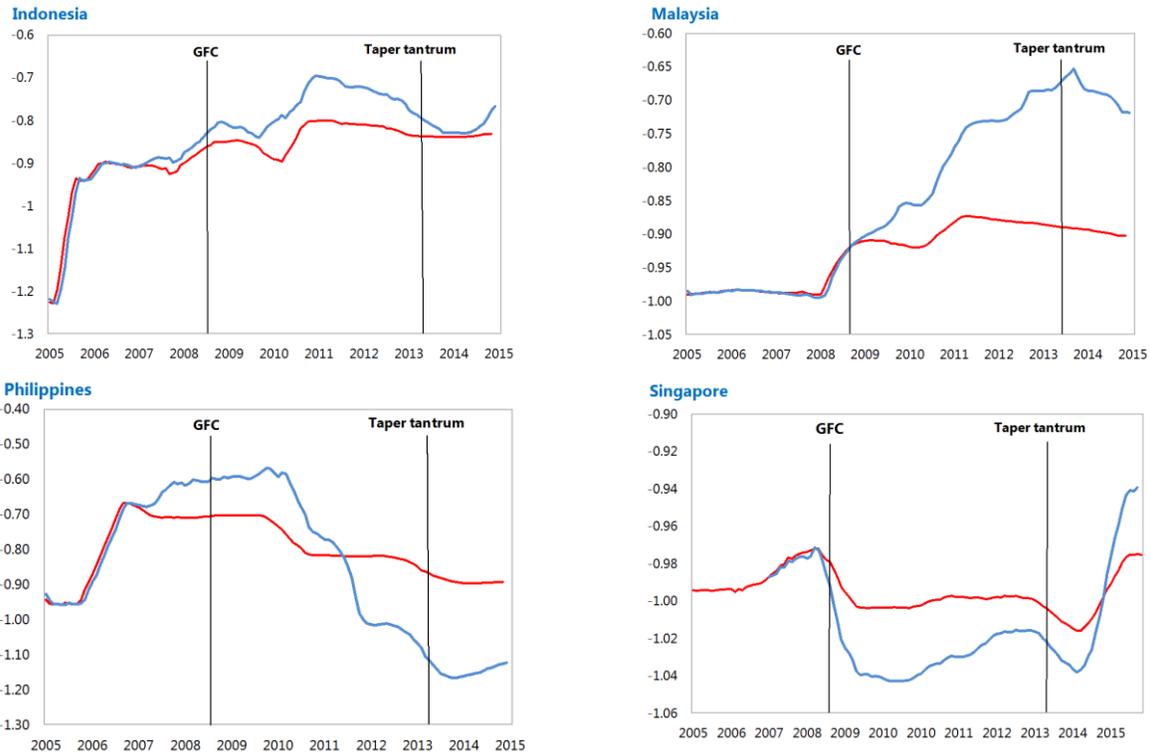


Sources: The figure reports a measure  $\rho_j \equiv \sigma_j^{NFA} / (\sigma_j^{NFA} + \sigma_j^S)$  where  $\sigma_j^{NFA}$  and  $\sigma_j^S$  denote the standard deviations of changes in net foreign assets and in nominal exchange rate, respectively. Gray bars correspond to countries with *de jure* pegs for most of the sample, and rest of the bars otherwise.

<sup>21</sup> Where losses exceed sustainable seigniorage revenue, or where laws or perception require a minimum central bank net worth, a weak balance sheet can challenge the ability of the central bank to operate independent of fiscal pressures. In the absence of systematic recapitalization, ongoing sterilization costs—and the often-resulting need for fiscal transfers—can eventually undermine central bank independence to the point where the monetary policy objectives are compromised (IMF 2015a).

<sup>22</sup> The central bank's net foreign asset position is used to estimate the total cost of rolling over an FX position. This may overestimate the cost of FXI in some specific cases, as discussed in footnotes 13 and 18 in Adler and Mano (2016).

**Figure 15. Sterilization Coefficients 1/-3/**



**Table 6. Sterilization Coefficients 1/**

	Pre-GFC	GFC	Post-GFC	Taper Tantrum
Indonesia	-0.957	-0.901	-0.838	-0.824
Malaysia	-0.933	-0.914	-0.871	-0.839
Philippines	-0.806	-0.709	-0.765	-0.833
Singapore	-0.989	-0.981	-1.000	-1.004
Thailand	-1.000	-1.000	-1.000	-1.000

1/ Average sterilization coefficient using one-month extended window in the following periods: pre-GFC (starting January 2005 or onward data available up to August 2008), GFC (September 2008 to March 2009), post-GFC (April 2009 to April 2013) and taper tantrum (May 2013 to December 2013).

Source: IMF staff estimates.

- 1/ The extent of sterilization coefficient ( $\beta$ ) is estimated following the approach of Aizenmann and Glick (2008), with simple regression of the change in net domestic assets (NDA) on the change of net foreign assets (NFA), scaled by the level of reserve money stock a year (or 12 months) ago, as:  $dNDA/RM(-12) = a + \beta * dNFA/RM(-12) + e$ .
- 2/ Red line: one month extended window; Blue: 60 month rolling window for ASEAN-4, 80-month rolling window for Singapore.
- 3/ Sample period for Philippines, Indonesia and Thailand: monthly data from 2001–2015; for Malaysia and Singapore: monthly data from 2002–2015.
- 4/ Average sterilization coefficient using one-month extended window in the following periods: pre-GFC (starting January 2005 or onward data available up to August 2008), GFC (September 2008 to March 2009), post-GFC (April 2009 to April 2013) and taper tantrum (May 2013 to December 2013).

departures in several ways using both survey-based expectations and statistical model estimates. The average ex-ante total costs for Indonesia, Philippines, Thailand, Malaysia, and Singapore are 0.6, 0.7, 0.9, 1.0 and 1.3 percent of GDP, respectively. The total cost for the median EME, on the other hand, is 0.5 percent of GDP. Total costs of FX reserve buffers for ASEAN-5 countries seem to be in line with a broad sample of countries, albeit slightly on the high side (Figure 16).

### C. MPPs, CFMs, and the Financial Cycle

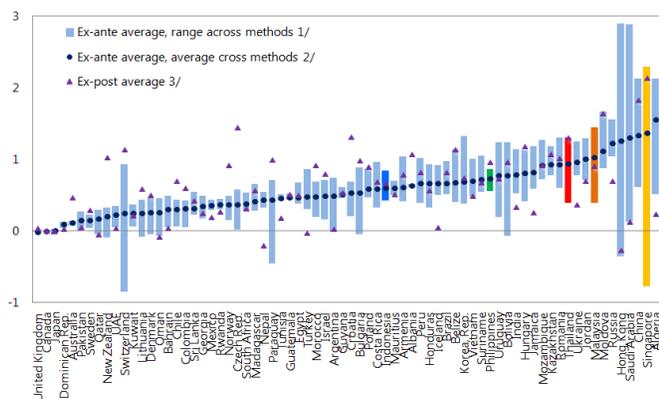
#### 23. Capital inflows present

**opportunities, but they can also pose stability risks.** Capital inflows, if channeled effectively, represent an opportunity to address long-standing investment needs, such as in infrastructure (Sahay and others, 2015). However, capital inflows, especially short-term portfolio flows, need to be managed carefully in order to avoid macroeconomic and financial stability risks.

#### 24. Capital flows can give rise to financial stability risks through different channels

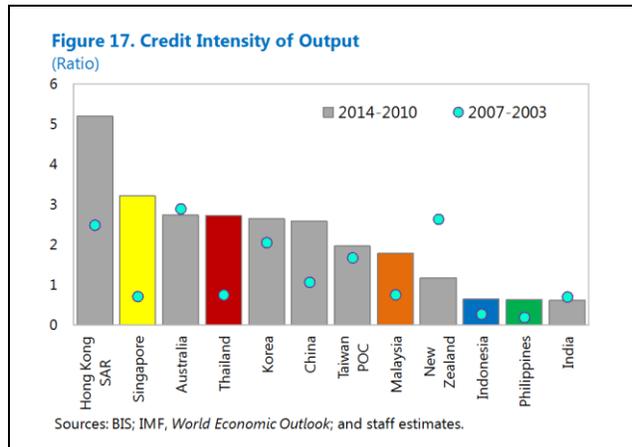
(IMF 2014a), including: (i) increases in short-term wholesale funding of the banking system; (ii) increases in foreign currency funding of the financial system; (iii) contributions of capital inflows to local credit booms and asset price appreciation; and (iv) credit risks from foreign currency denominated loans. While (i), (ii), and (iv) are beyond the scope of this paper, credit cycles related to capital inflows can complicate monetary management and also raise systemic risks, with implications for macroeconomic stability and the conduct of monetary policy. Asia's economic and financial history also suggests that high liquidity growth at a time of large capital inflows increases the risk of asset price boom and bust cycles (Gupta and others, 2009) that could lead to potential feedback loops between the corporate/household sectors and banks.

**Figure 16. Average Total Cost of FX Intervention, 2002–13**  
(In percent of GDP)



Source: IMF, *International Financial Statistics*; and IMF staff estimates.  
1/ Range between the minimum and maximum estimated ex-ante country-average across different methods.  
2/ Average of ex-ante country averages across methods.  
3/ Ex-post country average.

**25. Capital inflows and low interest rates accelerated credit growth in the ASEAN-5 economies during the UMP period, as in the rest of Asia** (IMF 2015c). The ASEAN-5 economies' strong growth performance in the aftermath of the GFC came on the back of a strong rise in private credit. However, this faster credit growth has been associated with an increase in the credit intensity of output—the change in credit-per-unit increase in GDP—pointing to a decline in the stimulative effect of credit in the post-GFC period. If the decline in credit intensity was related to purchases of existing real assets (including real estate) or to finance purchases of financial assets and reflected a greater attraction to debt in a low interest environment, it may raise the likelihood of boom bust cycles. Since episodes of rapid credit growth in Asia have been characterized by a higher incidence of crises relative to other EMEs (IMF 2011b), whether the global financial cycle has driven domestic credit booms and thus raised systemic risks in the ASEAN-5 economies is an important consideration.



**26. We use alternative approaches to identify credit booms in the ASEAN-5 economies.**

There is no single criterion to identify credit booms in the literature, so we use three different methodologies from previous studies. The first one is that of Mendoza and Terrones (2008), which looks at deviations of real credit per capita from its Hodrick-Prescott trend, identifying credit booms when the deviation from trend is larger than 1.75 times its standard deviation. The second one is that of Dell'Aricia and others (2012), which looks at deviations of credit-to-GDP from a rolling cubic trend. The last methodology is that of Chapter 3 of the IMF's *Global Financial Stability Report* (GFSR) of September 2011 (IMF 2011a), which finds that increases in the credit-to-GDP ratio above 3 percent could serve as early warning of credit booms, with increases above 5 percent indicating more advanced and severe credit booms.

**27. All three approaches identify credit booms prior to the AFC in all ASEAN-5 economies, but the evidence for credit booms since then is limited** (see Table 7). The three methodologies identify credit booms in ASEAN-5 countries prior the AFC. However, except for Singapore, none of the methodologies show that the ASEAN-5 economies experienced credit booms in the run up to GFC or thereafter. In addition, in the case of Singapore, more weight should be given to the first two approaches because the credit to GDP ratio is very high because it is a financial center and thus the GFSR approach is more likely to find variations in its credit to GDP ratios that surpass the thresholds.

**Table 7. Heat Map on the Evidence of Credit Booms 1/–4/**

	Pre-AFC (1996-97)			Pre-GFC (2007-08)			Post-GFC/UMP (2009-2012)			Post-Taper Tantrum (2013-15)		
	M&T	D&O	GFSR	M&T	D&O	GFSR	M&T	D&O	GFSR	M&T	D&O	GFSR
Indonesia	0.09	-0.98	-0.53	-0.30	5.22	1.18	-0.29	3.76	0.89	-0.29	3.65	1.06
Malaysia	0.05	16.58	20.87	-0.23	1.38	1.22	-0.19	2.66	2.73	-0.17	2.27	2.59
Philippines	0.10	20.98	8.95	-0.36	2.14	0.58	-0.35	2.96	0.86	-0.24	7.51	2.57
Singapore	-0.02	7.89	6.90	-0.12	11.16	9.25	-0.12	3.98	3.84	-0.04	4.43	5.06
Thailand	0.07	12.27	17.26	-0.25	1.60	1.40	-0.22	4.83	4.74	-0.17	3.49	4.05

1/ Shades of green indicate lower threshold/early warning of credit boom; shades of red indicate that credit is above upper threshold/evidence of a credit boom.

2/ Figures under Mendoza and Terrones, 2008 (M&T) refer to the deviations of log real credit per capita from its HP trend times 1.75 the trend's standard deviation. The deviations are averaged for the sub-periods identified. Positive figures shaded in red indicate an evidence of credit boom.

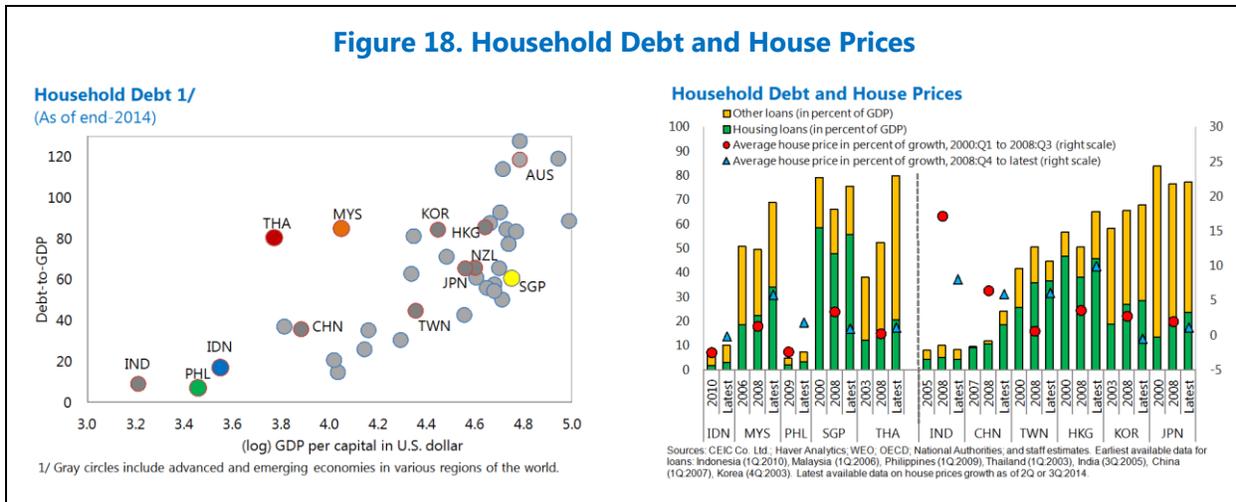
3/Figures under Dell'Ariccia and others, 2012 (D&O) refer to the average growth of credit-to-GDP ratio for the sub-periods identified. Figures shaded in green and red show ratio above the lower cut-off at 10 percent ratio and upper threshold at 20 percent ratio,

4/ Figures under the IMF's GFSR refer to the annual change in credit-to-GDP ratio in percentage points, averaged for the sub-periods identified. Figures shaded in green and red identify change in credit-to-GDP ratio above 3 percentage points and 5 percentage points, respectively.

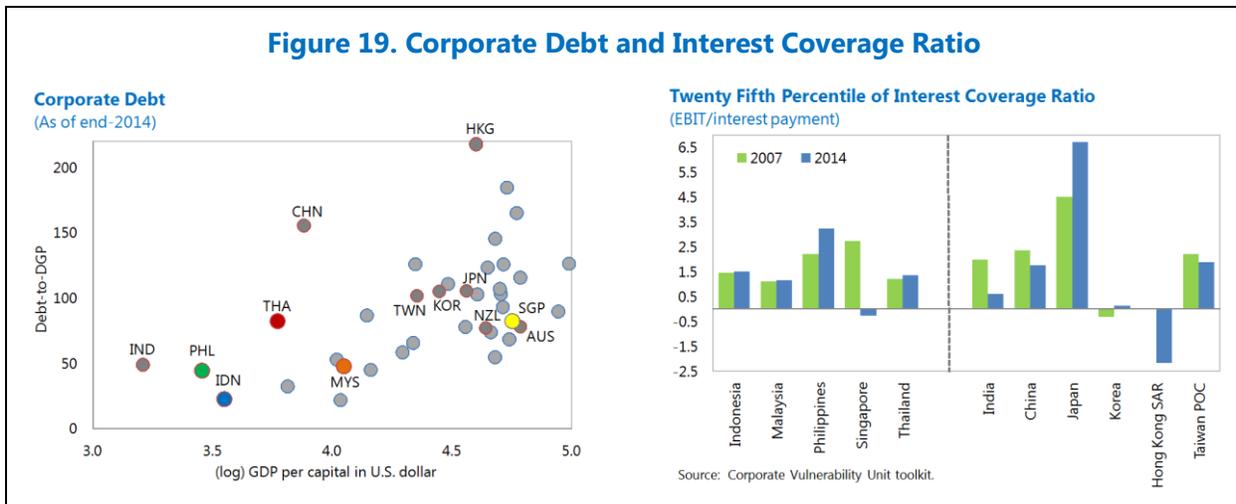
**28. The limited evidence of broad based credit booms masks pockets of sectoral imbalances.** While increasing credit-to-GDP ratios can be regarded as part of financial deepening in emerging markets, a few countries in the region seem to have much higher ratios than what their GDP per capita would imply. In recent years, household debt has increased rapidly in Malaysia and Thailand, with household debt-to-GDP ratios now standing above 80 percent of GDP in both economies. Moreover, the run up in household debt was driven by mortgage lending during a period of rapid house price inflation. To assess the financial stability risks of household debt, it is important to consider the other aspects of the household balance sheets (D'Alessio and Iezzi 2013), which is beyond the scope of this study, but the trends have drawn the attention of central banks and financial regulators in the region. On the other hand, levels of corporate debt in the region appears manageable notwithstanding the rise in corporate leverage during the UMP period, although aggregate measures may mask pockets of vulnerability among a segment of corporates or a few firms that would be the focus of microprudential supervision and financial surveillance<sup>23</sup> (Figure 19).

<sup>23</sup> The rising corporate leverage show pockets of vulnerability to interest rate shocks. The exceptionally accommodative monetary policy across major advanced economies can facilitate greater corporate leverage through the relaxation of emerging market borrowing constraints owing to the widespread availability of lower-cost funding and appreciated collateral values (IMF 2015d). Corporate debt has been rising in ASEAN-5, led by Singapore and Thailand having more than 80 percent corporate debt-to-GDP ratios as of end-2014. However, buffers barely moved between 2007 and 2014, with only the Philippines increasing its 25<sup>th</sup> percentile of interest coverage ratio while ICR significant declined in Singapore.

**Figure 18. Household Debt and House Prices**



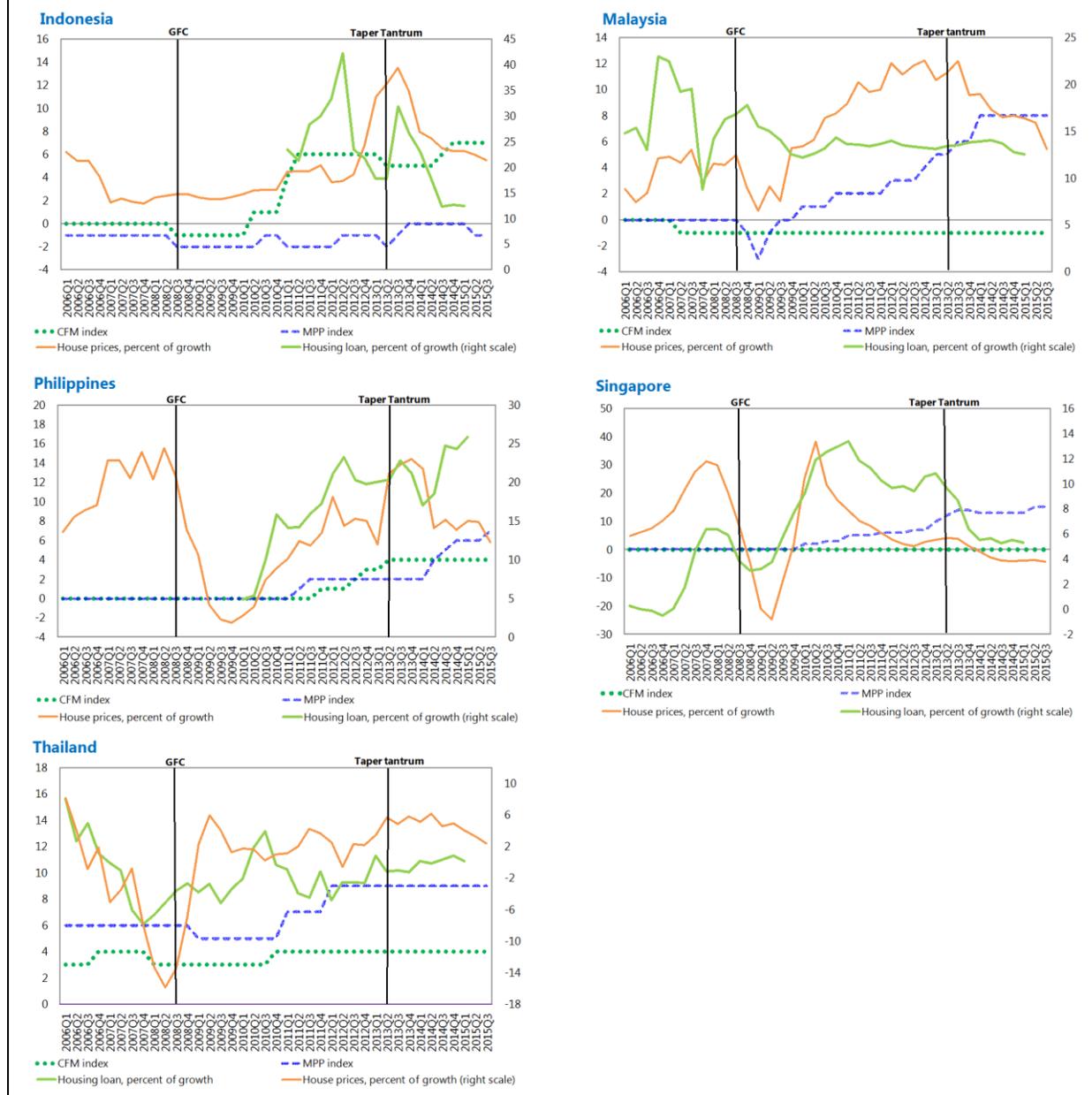
**Figure 19. Corporate Debt and Interest Coverage Ratio**



**29. Addressing financial stability risks of rising household leverage and the real estate price cycle would explain the broadening of the toolkit to sectoral MPPs in the ASEAN-5 economies.** Updated MPP and CFM indices compiled by Zhang and Zoli (2014) show an increasing use of MPPs in the ASEAN-5 economies in the wake of the GFC (Figure 20), particularly of housing-related measures.<sup>24</sup> While a comprehensive quantitative assessment of their effectiveness in taming the housing leverage and asset price cycles in the ASEAN-5 economies is not feasible given the limited tightening episodes and time span, a visual inspection of trends provide preliminary evidence of efficacy. In Indonesia, housing loan growth slowed from its peak of 32 percent y/y in Q3:2013 to 12 percent in Q3:2014, following the tightening of loan-to-value (LTV) ratios in June and September 2013. House price inflation in Indonesia also slowed from 13.5 percent in Q3:2013 to

<sup>24</sup> CFMs and MPPs can overlap. To the extent that capital flows are the source of systemic financial sector risks, the tools used to address those risks can be seen as both CFMs and MPPs (see IMF 2014a).

Figure 20. MPP, Housing Loans, and House Prices



Source: MPP and CFM indices from Zhang and Zoli (2014); and central bank websites/annual reports.

6.5 percent in Q3:2014, although other macrofinancial factors and the use of CFMs may also explain the change in asset price dynamics. This is in line with the findings of Zhang and Zoli (2014) that CFMs and housing-related MPPs have been effective in reducing housing price inflation in countries<sup>25</sup> that have used them more intensively. Malaysia and Thailand show patterns of a countercyclical response, with the loosening of MPPs following sharp declines in the growth of housing loans and prices during the GFC period, and tightening of measures (e.g. LTVs, real property gain tax, mortgages cap, etc.) during the upsurge in property credit and prices in the UMP period. House price growth clearly slowed following the tightening of MPPs in Malaysia alongside a relatively constant level of housing loan growth, although the tightening of domestic financial conditions post-taper tantrum may have also played a role. The impact of MPPs on the real estate cycle is less visible in Thailand but one cannot rule out a counterfactual scenario where real estate prices and household leverage would have continued to rise if MPPs were not tightened. Singapore shows a more typical pattern in the use of MPPs as in the rest of Asia and EMEs with a progressive tightening of mainly housing-related measures (Zhang and Zoli 2014) and a sharp fall in housing loans and prices.<sup>26</sup> The Philippines did not formally impose any MPPs to ease the pace of real estate loan growth but enhanced monitoring of banks' real estate exposures and introduced regular stress testing of housing loan portfolios that may have indirectly slowed house price appreciation and construction/real estate loan growth through moral suasion and enhanced supervision. Overall, the targeted actions focused on household debt and real estate prices with limited evidence of generalized credit booms, suggests that the ASEAN-5 central banks used MPPs primarily for financial stability considerations.

**30. The use of CFM measures has been geared towards managing volatile capital flows and systemic risks posed by the flows.**<sup>27</sup> The ASEAN-5 economies have relied mostly on domestic prudential tools, and the use of capital flow management measures was largely limited to reserve requirements on FX deposits, except for Indonesia and Thailand, where restrictions on bond holding period or withholding tax for foreigners were implemented. There is some evidence that those measures may have been effective in reining in the rapid rise in foreign participation in local currency bond markets (Figure 21), though vulnerability to shifts in foreign portfolio sentiment remained high. The Philippines also imposed a higher differential capital charge on domestic and foreign banks' NDF exposures as a macroprudential tool to reduce systemic risks of exchange rate fluctuations, that may also be classified as a CFM measure that significantly reduced NDF positions of onshore banks. In general, the limited reliance on CFMs in the ASEAN-5 economies may have reflected their negative experiences with such measures in the past and mixed views of their effectiveness in the literature (see Zhang and Zoli, 2014), as well as a more selective and targeted

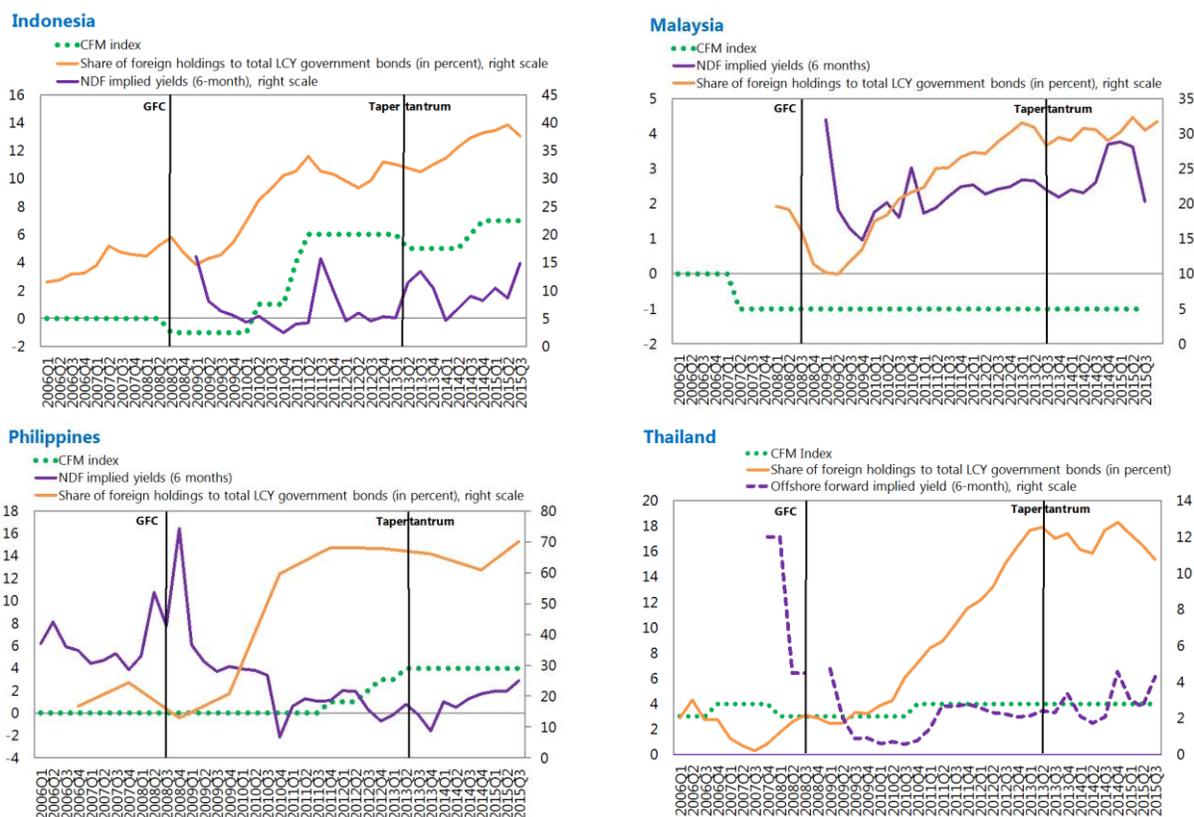
<sup>25</sup> Country grouping composed of Australia, Hong Kong SAR, Korea, New Zealand, Singapore and Taiwan Province of China.

<sup>26</sup> Singapore's additional buyer's stamp duty is considered both a MPP and a CFM measure.

<sup>27</sup> CFMs are designed to limit capital flows, by influencing the size or composition of these flows. They can also have an effect on macroeconomic outcomes, e.g., affect the exchange rate, even if this is not the main objective of the measure (IMF 2012).

approach that focused on changing the composition of capital flows to less volatile components would be more effective (Sahay and others, 2014).

**Figure 21. CFMs, Offshore Implied Yields, and Foreign Participation in Local Currency Government Bond Markets**



Sources: CFM indices from Zhang and Zoli (2014); central bank websites/annual reports; ADB Asian Bond Online; Philippine Bureau of Treasury (BTr); and Bloomberg L.P. BTr's data refers to the nonresidents' share of government securities holdings in the Philippines under custodial accounts of banks and may differ from the IMF's Coordinated Portfolio Investment Survey which includes offshore bonds in global peso notes and FX denominated Republic of Philippines bonds.

## POLICY RESPONSES TO CAPITAL OUTFLOW EPISODES

### A. Policy Responses to the GFC, Taper Tantrum, and Renminbi Adjustment

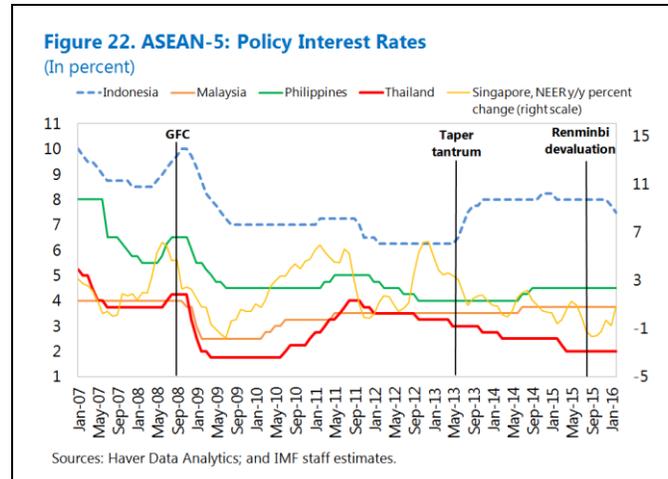
#### 31. ASEAN-5 economies used a wide range of policy tools to supplement monetary policy in addressing market pressures and its economic impact,

including fiscal measures, MPPs, CFMs, FX intervention, and liquidity provision measures into money markets (Table 8). In particular, while all countries raised their policy rates during the AFC to support their external positions, they eased their policy rates in the aftermath of the global financial crisis to support growth (Figure 22). By comparison, only Indonesia raised its policy rates during

the taper tantrum to support external position, while Malaysia and the Philippines subsequently tightened modestly for domestic stability considerations. Singapore and Thailand gradually eased their monetary policy stance from 2011–2012 reflecting the weakening economic outlook. During the 2015 summer turbulence, policy rates were left unchanged in all ASEAN-5 economies, as policymakers had to weigh concerns about capital flows reversals that were largely confined to portfolio equity flows against those of slowing economic activity. However, only in January 2016 did Indonesia start loosening monetary policy to support domestic demand.

#### 32. A differential response was observed across countries and episodes depending on the circumstances

(Table 8). During the GFC, Indonesia, Malaysia and the Philippines lowered banks' reserve requirements and expanded liquidity provision measures to preserve orderly money market conditions. Moreover, all ASEAN-5 economies expanded depositor insurance guarantees. Fiscal stimulus packages were also implemented to stimulate growth. In contrast, during the taper tantrum episode, Indonesia—the ASEAN-5 country under the most pressure—had to give priority to stability over supporting economic activity. Reserve requirements and the loan-to-value ratio were tightened to contain credit growth while the exchange rate and the long-term bond yields were allowed to move freely after an initial period of containment. Fiscal policy was also tightened, with an average 33 percent increase in subsidized fuel prices, to address external and fiscal imbalances. Conversely, the minimum holding period for central bank bills were shortened to increase their liquidity and attract more foreign inflows. During the summer of 2015, reserve requirements were left unchanged, but were reduced in December and January in Indonesia and Malaysia, respectively.



**Table 8. Policy Tools Used During the GFC and Taper Tantrum**

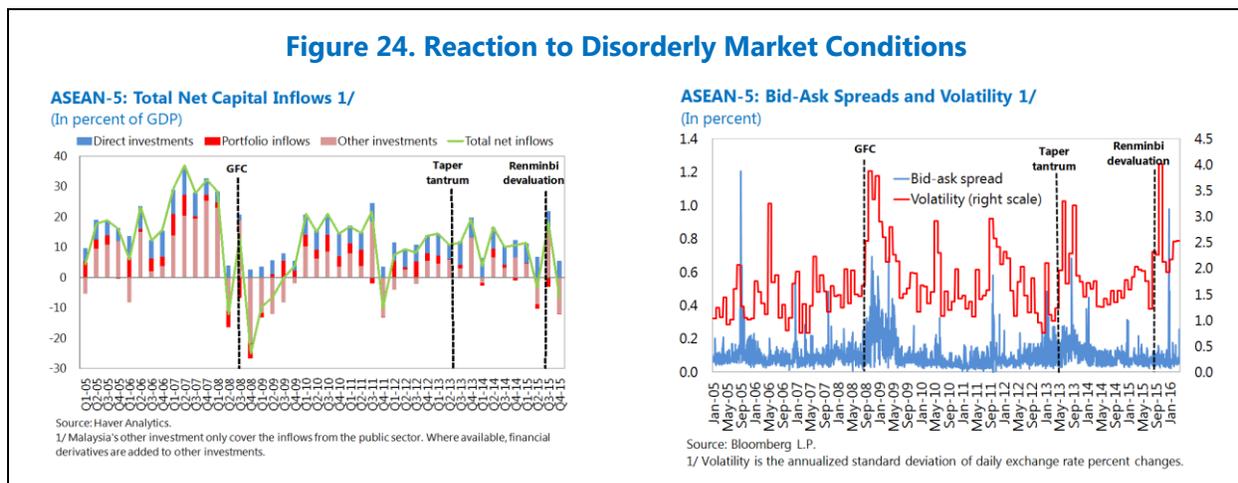
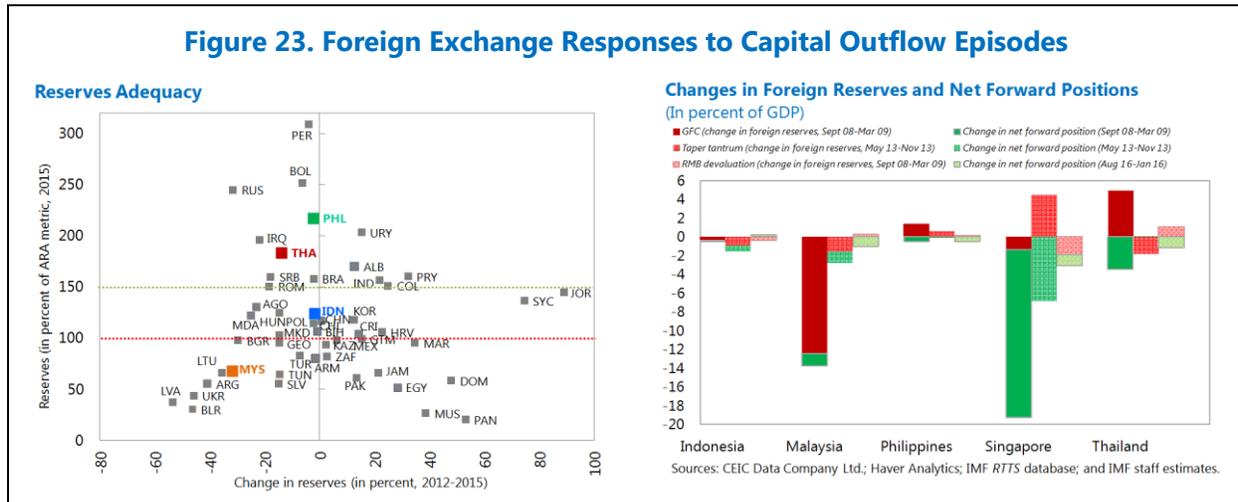
	Indonesia			Malaysia			Philippines			Singapore			Thailand		
	GFC	Taper Tantrum	Summer 2015	GFC	Taper Tantrum	Summer 2015	GFC	Taper Tantrum	Summer 2015	GFC	Taper Tantrum	Summer 2015	GFC	Taper Tantrum	Summer 2015
Policy rate <sup>1/</sup>	Lowered	Raised	Unchanged	Lowered	Unchanged	Unchanged	Lowered	Unchanged	Unchanged				Lowered	Lowered	Unchanged
Exchange rate corridor band <sup>1/</sup>										Recentered to validate a weaker currency <sup>1/</sup>	Unchanged	Unchanged			
Exchange rate depreciation		Yes		Yes(?)				Yes					Yes		
Drawdown of Reserves								Yes							
Macroprudential policy		Tightened LTV for motor vehicles and residential properties			Imposed limit on mortgage term, max tenure of financing for personal use								Restricted motor vehicle and public housing loans, measures of property loans; imposed limits on total debt servicing ratio		
Reserve requirements	Lowered	Raised		Lowered			Lowered								
Capital flow measures		Shortened minimum holding period for central bank bills						Imposed limits on banks' NDF exposures							
FX interventions	Yes	Yes	Yes	Yes		Yes				Yes					Yes
Liquidity provision measures	Yes	Yes		Yes			Yes								
Expansion of deposit insurance coverage	Yes			Yes			Yes			Yes			Yes		
Expansion of eligible collateral for short-term financing	Yes														
Loan guarantees													Yes		
Fiscal policy	Expansive	Reduced fuel subsidies		Expansive			Expansive			Expansive			Expansive		
Other measures		Swap arrangements with other countries; contingent loans													

Sources: IMF, ASEAN-5 countries' staff report for the Article IV consultation.

<sup>1/</sup> Unlike the other ASEAN-5, Singapore does not use the policy rate as main monetary policy instrument. Instead, it uses the exchange rates corridor band.

**33. Foreign reserves were used as a buffer, coupled with greater exchange rate flexibility, to help cushion the economy and avoid disorderly market conditions.** All ASEAN-5 currencies came under severe pressure and depreciated significantly during the GFC, letting the exchange rate act as a shock absorber. The net capital outflows during the taper tantrum was not as large as in the GFC, but there was greater differentiation by the markets of the strength of the countries' macro fundamentals, with Indonesia, in particular, facing severe pressure owing to its twin deficits, prompting more FX intervention to avoid disorderly market conditions (Figure 24, IMF 2015f). Moral suasion in the FX market and purchases of government securities by Bank Indonesia were also reduced to allow for price adjustments with greater transparency on market interventions and enhanced communications with market participants. During the 2015 summer turbulence, all ASEAN-5 economies suffered from financial market volatility particularly in equity markets. However, the foreign reserve drawdown was most pronounced in Indonesia and Malaysia, the two commodity exporters that were most affected by the oil price collapse and required an external adjustment to smooth the external shock, with reserves falling close to the Fund's reserve adequacy metric. Overall,

greater exchange rate flexibility, helped smooth “excess” volatility and/or preserve orderly market conditions during the turmoil.<sup>28</sup>



**34. In some circumstances, the motivation for FX intervention may be to mitigate capital flow shocks and counter potentially disorderly market conditions.** In particular, in periods of excessive currency volatility the exchange rate can stop operating as a shock absorber and may become a shock amplifier, including through balance sheet concerns. FX intervention can help counter such conditions; it can be sustained but needs to be two-sided as observed in the ASEAN-5 countries. Excessive intervention however is not without risks, especially to the extent that frequent use of FX intervention may undermine the clarity and credibility of the monetary policy framework, although good communication and enhanced transparency could help clarify objectives. There is also the related question of the consistency of the overall policy mix, and the need to ensure that

<sup>28</sup> Exchange rate volatility and/or overshooting a level consistent with macroeconomic fundamentals does not constitute disorderly market conditions per se, but only to the extent that it amplifies adverse shocks.

objectives are congruent and the use of FX intervention does not substitute for other needed policy changes. FX intervention benefits in terms of dampening shocks should also be weighed against their potential costs to the credibility of the policy framework, particularly when FX intervention is frequent and disorderly market conditions are absent (IMF 2015e). As an analytical exercise, the impact of adding FX intervention to a standard Taylor-rule type of monetary policy function in a modified Forecasting and Policy Analysis (FPAS) model is explored in Ding and Peiris (forthcoming).

## LESSONS FROM EVOLUTION OF MONETARY POLICY FRAMEWORKS

**35. In the past two decades, monetary policy frameworks in the ASEAN-5 economies have evolved substantially mainly in response to the AFC in 1997–1998 and the GFC in 2007–2009.**

Before the AFC, the ASEAN-5 economies had tightly pegged exchange rates, which became a source of vulnerabilities such as excessive borrowing and currency mismatch by corporates and banks. As a result, the exchange rates came under severe pressure and depreciated sharply when investors became risk averse and capital flows reversed. After the AFC, the ASEAN-5 economies adjusted their policy frameworks to allow more exchange rate flexibility in order to gain more monetary policy autonomy in the context of a more open capital account. All the countries have low inflation as an objective of monetary policy with some of them (Thailand, Indonesia, and Philippines) adopting an inflation targeting regime including in the context of a Fund-supported program (Thailand) and post-program monitoring arrangements (Indonesia and the Philippines). They also built up their foreign reserves as insurance against volatility shocks and strengthened their financial regulatory frameworks.

**36. Monetary policy frameworks of the ASEAN-5 economies on the whole have performed well, delivering both price and output stability during a period of significant domestic and regional turbulence and transformation.** A flexible inflation-targeting framework including a unique exchange rate based targeting approach in Singapore has served the ASEAN-5 economies well and provide lessons to other EMDEs. Not surprisingly, therefore, success in terms of outcomes in most cases entailed significant changes to operating frameworks and refinement of policy objectives in response to challenges in the external environment.

**37. The ASEAN-5 economies were more resilient than other EMEs during the GFC because of relatively low financial and external vulnerabilities** (Jeasakul and others, 2014). This was the result of a decade of financial and structural reforms following the AFC with refinements to the monetary policy framework playing an important role. The move to a more flexible exchange rate regime in the region consistent with Fund policy position, along with the adoption of stricter microprudential and macroprudential policies, helped avoid a buildup of short-term foreign

currency debt unlike the pre-AFC period and allowed the exchange rate to act as an effective shock absorber during the GFC. Alongside this policy shift, foreign reserves in these economies also rose significantly providing an important buffer to capital flow volatility. The authorities also made efforts to develop their capital markets to provide alternative source of financing and deepen their financial markets.

**38. That said, financial integration and volatility of capital flows has made the ASEAN-5 economies' domestic financial conditions susceptible to global financial spillovers, albeit with policy rates and liquidity management still important for monetary transmission.** The ASEAN-5 economies strong macroeconomic fundamentals and responsive monetary policy frameworks continued to maintain domestic balance despite the strong influence of global factors on domestic financial conditions. Fully sterilizing the buildup of reserve buffers active liquidity management has helped insulate aggregate credit conditions and anchor market expectations, but has entailed significant quasi-fiscal costs. The Fund's reserve adequacy metric suggests that the reserve buildup in some of the ASEAN-5 economies may have been excessive at times, especially during periods of surges in capital inflows, although in general reserves have been drawn down during periods of capital outflows, with no statistical evidence of targeting a specific level of the exchange rate.

**39. The broadening of the toolkit to MPPs was related to the risk posed to financial stability and the sectoral nature of the risk.** In an open economy, raising the policy rate to dampen overheating pressures may induce even more capital inflows and exacerbate the financial stability challenge (IMF 2014b). Besides, monetary policy has an economy wide impact, and can be too blunt to address sector-specific overheating as it will have unintended effects on other sectors of the economy. The limited evidence of generalized credit booms but the emergence of pockets of excessive leverage among households and house price inflation in the ASEAN-5 economies may explain the widespread use of sectoral MPPs and instead of monetary policy and/or countercyclical MPPs (see IMF 2015c,d).

**40. Further evolution of frameworks is likely in the conduct of monetary policy in the "new normal"** (Bayoumi and others, 2014). In the aftermath of the GFC and the corresponding UMP period, taper tantrums and asynchronous monetary policies in AEs, recent policy debates have centered on the effectiveness of conventional countercyclical instruments and the interactions with MPPs and CFMs in containing sector-specific overheating and systemic risks (IMF 2014b). The normalization of U.S. monetary policy should provide greater scope for monetary policy independence in the ASEAN-5 economies given the limited impact of conventional and UMPs of other jurisdictions. However, ASEAN-5 economies may need to consider the implementation of more countercyclical MPPs (such as Basel III's countercyclical capital requirements) and/or loosening existing MPPs and CFMs in the event of a prolonged period of lower global growth or negative shocks (IMF 2016a), balance sheet considerations permitting.

**41. Going forward, additional intermediate objectives (such as financial and external stability) will play a greater role than in the past** (Bayoumi and others, 2014). When possible, these should be targeted with additional instruments (e.g., MPPs, CFMs, and FX intervention). The use of MPPs in the ASEAN-5 economies is a case in point but new challenges may arise if, for

example, reserve buffers were to fall below critical levels and/or generalized credit and asset price booms were to materialize. The reversal of post-crisis accommodative global financial conditions poses risks to household and corporate balance sheets in the ASEAN-5 economies, as leveraged households and corporates find it increasingly difficult to service their debt (IMF 2015d). While the current exposure to FX denominated debt in the region is lower than in the pre-AFC period, the ASEAN-5 economies have relatively higher exposure compared to regional counterparts. In addition, should these measures prove insufficient, interest rate policy might have to play a role (IMF 2015f). Furthermore, when asset price and inflation cycles diverge, monetary policy may face a difficult dilemma (see IMF 2013b). The ASEAN Economic Community's move towards financial liberalization and freer capital flows within the ASEAN region by 2025 may also pose additional cross border and financial sector challenges.

	Indonesia	Malaysia	Philippines	Singapore	Thailand
<b>Mandate, Objective and Strategy</b>					
1. Central bank mandate	Achieve and maintain the stable value of rupiah.	Promote monetary and financial stability conducive to the sustainable growth of the Malaysian economy.	Promote and maintain price stability; provide proactive leadership in bringing about a strong financial system conducive to a sustainable growth of the economy.	Maintain price stability; foster a sound and reputable financial centre and promote financial stability; ensure prudent and effective management of foreign reserves; and grow Singapore as an internationally competitive financial center.	Maintain monetary stability and stability of the financial and payment systems.
2. Primary monetary policy objective	Stable price of goods and services; and stable exchange rate.	Price stability	Price stability	Price stability	Price stability
3. Stated monetary policy framework	Inflation targeting (2005)	Implicit inflation targeting	Inflation targeting (2002)	Implicit inflation targeting	Inflation targeting (2000)
4. Medium-term inflation target <sup>1</sup>	Government approved inflation target 2013–2015: 4.0% ±1 percentage point (ppt)	Comfort level of about 3%	Government approved inflation target 2015–2018: 3.0% ±1 ppt	Comfort level of about 2%	Government approved inflation target 2015: 2.5% ±1.5 ppt
5. Intermediate monetary policy target <sup>2</sup>	BI inflation forecast <ul style="list-style-type: none"> <li>• 2015: below midpoint of 4%.</li> </ul>	BNM inflation forecast 2015: 2–3%	BSP inflation forecast <ul style="list-style-type: none"> <li>• 2015: below the range of 3.0% ± 1.0 ppt;</li> <li>• 2016: low end of 3.0%±1.0 ppt</li> <li>• 2017: midpoint of 3.0%±1.0 ppt</li> </ul>	<i>Explicitly stated:</i> Nominal effective exchange rate (NEER), with undisclosed location and parameters of the band and weights of currencies in NEER basket.	BOT inflation forecast <ul style="list-style-type: none"> <li>• 2015: -0.9%</li> <li>• 2016: 1.2%</li> </ul>
<b>Independence</b>					
6. De jure operational independence	Yes, with exceptional cases for lending to systemic important banks.	Yes	Yes	Yes	Yes
7. De jure operational (i.e., inflation targets)	Set by the government based on Central Bank recommendation	Yes. BNM sets its own targets.	Needs intergovernmental committee approval on inflation target.	Yes. MAS sets its own inflation targets.	Needs Finance Minister and Cabinet approval on inflation target.

	Indonesia	Malaysia	Philippines	Singapore	Thailand
<b>Policy Instruments</b>					
8. Central banks' policy rate/stance	BI policy rate, deposit and lending rates	BNM overnight policy rate	BSP overnight reverse repo (RRP) or borrowing rate, overnight repo (RP) or lending rate, and SDA rate	MAS indicates level, slope and width of NEER band every six months	BOT 1-day bilateral repo rate
9. Reserve requirement	Yes	Yes	Yes	Yes	Yes
Statutory reserve requirement ratio (RRR)	Primary RRR (7%) + secondary RRR on liquid assets (2.5%)	3.5%, commercial banks	20%, universal and commercial banks	3%, all banks	1%, commercial banks
10. Open market operations	<ul style="list-style-type: none"> <li>• Issuance of BI certificates</li> <li>• Repo and reverse repo transactions on government securities</li> <li>• Outright sales/purchase of government securities</li> <li>• Foreign exchange buying/selling against the rupiah</li> </ul>	<ul style="list-style-type: none"> <li>• Uncollateralized direct borrowing</li> <li>• Repo and reverse repo of government securities</li> <li>• Issuance of BNM notes</li> <li>• Outright sales/purchase of government securities</li> <li>• Foreign exchange swaps</li> </ul>	<ul style="list-style-type: none"> <li>• Repo and reverse repo transactions on government securities</li> <li>• Outright sales/purchase of government securities</li> <li>• Foreign exchange swaps</li> </ul>	<ul style="list-style-type: none"> <li>• Issuance of short-term MAS bills</li> <li>• Repo and reverse repo transactions on SG securities</li> <li>• Foreign exchange swaps</li> </ul>	<ul style="list-style-type: none"> <li>• Issuance of BOT bills</li> <li>• Bilateral repo transactions on purchase/sale of securities</li> <li>• Outright sales/purchase of primarily BOT and government bonds</li> <li>• Foreign exchange swaps</li> </ul>
11. Standing facilities	Deposit and lending facilities	Deposit and lending facilities	<ul style="list-style-type: none"> <li>• Fixed-term deposit (Special Deposit Accounts) facility</li> <li>• Lending (rediscounted rates) facility</li> </ul>	<ul style="list-style-type: none"> <li>• Overnight deposit and lending facilities</li> <li>• Overnight RMB foreign currency lending facility</li> </ul>	Deposit and lending facilities
<b>Transparency and Communications</b>					
<i>Explanation on:</i>					
12. Monetary Policy Objective	Yes	Yes	Yes	Yes	Yes
13. Monetary Policy Framework	Yes	Yes	Yes	Yes	Yes
14. Intermediate target	Yes, inflation target	Yes, short-term interest rate movements	Yes, inflation target	Yes, direction of NEER policy band	Yes, inflation target
15. Decision making process	Yes	Yes	Yes	Yes	Yes
16. Rationale/basis of monetary policy decisions/stance	Yes	Yes	Yes	Yes	Yes

	Indonesia	Malaysia	Philippines	Singapore	Thailand
<i>Timing of publication:</i>					
17. Inflation report	Monthly	Not available	Quarterly	Semi-annual	Quarterly
18. Public release of monetary policy stance	Same day	Same day	Same day	Same day	Same day
19. Minutes/highlights of monetary policy meetings	Yes	Not available	A month after meeting date	Not available	Two weeks after meeting date
<b>Accountability</b>					
20. Report on monetary policy operation	Yes, quarterly report to the Parliament/public	Yes, regular reporting to the Minister of Finance on policies related to principal objectives.	Yes, annual report to the President and Congress/public	Yes, annual report to the Parliament	Yes, semestral report to the Cabinet
21. Public document/explanation in case of missed target	Yes, report to the Parliament/public		Yes, open letter to the President	NA	Yes, open letter to the Minister of Finance
Sources: IMF, ASEAN-5 Desk Survey; central banks' websites.					
<p>1/ The numerical <i>medium-term inflation objective</i> is distinct from the near-term inflation forecast. The inflation objective is modified rarely, and not due to short-term political pressures or conjunctural circumstances, but rather as part of a systematic and transparent review of the entire monetary policy framework (IMF 2015a).</p> <p>2/ <i>The intermediate target</i> refers to a variable correlated to the ultimate objective that monetary policy can affect more directly and that the central bank treats as it were the target for monetary policy, or as a proxy for the ultimate policy objective (Laurens, B., and others, 2015). Intermediate targets are tools to assist in achieving the policy objectives, and not policy objectives in themselves (IMF 2015a).</p>					

## Appendix II. ASEAN-5: Estimation of Monetary Policy Rules<sup>1</sup>

### Introduction

This Appendix outlines the methodology used to analyze and describe key stylized facts about how macroeconomic developments guide monetary policy settings for the ASEAN-5 countries, as described in the main text. The analysis relies on the estimation of Taylor rules, which have been widely used to provide insightful and simple summary descriptions of complex monetary policy decisions. However, instead of relying on either a single equation or small number of preferred equations, the results from the estimation of a large number of plausible models are aggregated. The results and main conclusions are also summarized.

### Specification of the Taylor Rule

The standard Taylor rule specification is presented below:

$$i_t = \alpha + \rho i_{t-1} + (1 - \rho) (\beta_1 (\pi_t - \bar{\pi}_t) + \beta_2 ygap_{t-1}) + \varepsilon_t$$

The policy interest rate ( $i_t$ ) is assumed to be adjusted smoothly and is expressed as a weighted average of the lagged policy interest rate and the desired policy settings based on economic variables: the inflation rate ( $\pi_t$ ) or, as applicable, the deviation from its targeted rate ( $\bar{\pi}_t$ ), and the lagged output gap ( $ygap_{t-1}$ ). While conceptually the rule is straight forward, empirically there are several options available when measuring these variables, including headline or core inflation; or expected inflation might be more relevant and its significance could indicate a more forward looking monetary policy framework. Alternative measures of the output gap are also considered. These are computed as deviations from a rolling one-sided Hodrick-Prescott filter with one measure using the standard parameter of 1,600 whereas a second uses a larger parameter of 16,000, producing a smoother measure of potential output and thus larger and more persistent output gaps.

Additional explanatory variables can be added to the standard Taylor rule to assess their influence on policy rate settings. Options include various measures of the exchange rate, measures of global uncertainty, and United States interest rates. The relevance of the exchange rate for monetary policy can be greater in emerging markets relative to advanced economies, given less developed financial markets and stronger exchange rate pass-through to inflation and expected inflation. Given this, policymakers are more likely to focus on exchange rates, and other studies have found a role for the exchange rate in determining policy rates, even in inflation targeting regimes. Low interest rates in the United States and other advanced have coincided with sizeable capital inflows into emerging market economies which in turn may have prompted policymakers in those economies to keep policy rates lower than warranted by domestic conditions.

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<sup>1</sup> Prepared by Niamh Sheridan (APD).

In the case of Singapore, the rule can be modified to take into account the use by the MAS of the nominal effective exchange rate as the main instrument for monetary policy. Several papers have employed this approach and have found the modified Taylor Rule model to provide a good description of monetary policy settings for Singapore.<sup>2</sup> The results for Singapore are summarized in Box II.1.

### Thick Modeling Approach

The thick modeling approach avoids selection of one or a small number of preferred equation and instead involves estimation of all plausible combinations of potential explanatory variables. For example, each model includes one of the three inflation measures and also one of two measures of the output gap. In addition, an exchange rate variable could be included or a measure of U.S. interest rates or global volatility. This yields many plausible models, which are then estimated and the resulting coefficient estimates are averaged using bootstrap aggregation techniques. The technique also permits computation of standard errors.<sup>3</sup> This methodology thus provides insights as to whether a variable of interest guides policy decisions in general, and avoids overreliance on the statistical significance of a variable in a preferred specification.

### Empirical Results

In general, the Taylor rule models fit the data very well: R-squared are generally above 80 percent and frequently in excess of 90 percent. The estimated coefficients are summarized in the panel charts: the midpoint represents the average of the estimated coefficient over the range of models. The lagged dependent variable plays a key role and is above 60 percent in the case of Malaysia and very close to one in the case of Philippines. This suggests a gradualist approach to monetary policy.

**Inflation.** The analysis confirms the relevance of inflation in guiding policy rate settings. In most countries, the estimated reaction coefficient to expected inflation is higher than that on either inflation or core inflation suggesting that policymakers react more strongly to increases in the expected inflation rate. The inflation rate has the largest role in the case of Thailand, with statistically significant coefficients on average for all three variables and coefficient estimates in excess of one in response to increases in either core or expected inflation. An estimated coefficient estimate that is greater than one, implies that monetary policy responds to higher (lower) inflation with a larger change in the policy rate and as a result, the real interest rate increases (declines). For Indonesia, the headline inflation rate is the most relevant of the three measures but with an estimated coefficient of 0.5 percent falls implies that deviations of inflation from the target are not met with an increase in the real interest rate. By contrast while the estimated coefficients for the Philippines are all greater

<sup>2</sup> See for example, McCallum (2006), Parrado. (2010) and MAS (2013).

<sup>3</sup> Bootstrap aggregation, or ‘bagging’, involves re-sampling the random component embedded in the residuals over 10,000 iterations for each model specification; the coefficient estimates for each variable from each specification are the pooled to provide the aggregate coefficient estimate. The standard deviation for the coefficient estimate is then computed from the pooled sample of estimates. See Granger and Jeon (2004) for further discussion.

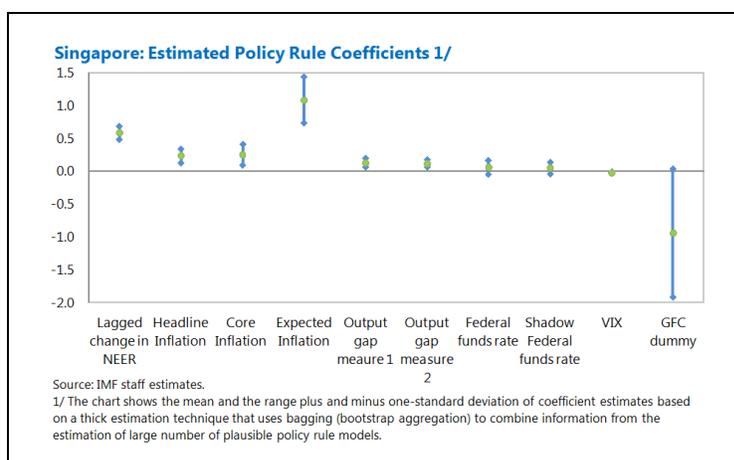
than one, none are statistically significant. On the other hand, Malaysia—the only non-inflation targeting central bank—appears least responsive to changes in inflation with estimated coefficients are that close to zero.

### Box II.1. Singapore: Monetary Policy Rules

For Singapore, the Taylor rule is reformulated with percentage change in the nominal effective exchange rate ( $\Delta neer_t$ ) replacing policy interest rate as the monetary policy instrument, as follows:

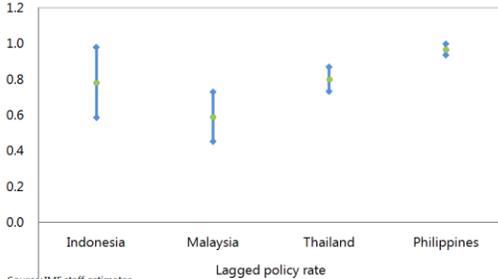
$$\Delta neer_t = \alpha + \rho \Delta neer_{t-1} + (1 - \rho)(\beta_1(\pi_t - \bar{\pi}_t) + \beta_2 ygap_{t-1}) + \varepsilon_t$$

The coefficient on the lagged change in the nominal effective exchange rate is about 0.6 on aggregate, suggesting a gradualist approach to policy that is typically seen in estimated interest rates rules. The estimated inflation reaction coefficients are positive, implying tighter monetary policy when the inflation rate rises. The estimated reaction is greatest for the expected inflation rate, suggesting a forward-looking policy framework and consistent with previous work on policy rates for Singapore. The estimated reactions to the output gap measures are small and positive, but are statistically significant when the smoother potential output measure is used. U.S. interest rates are not found to have a statistically significant impact on aggregate on monetary policy settings. Likewise, the impact of the VIX and the global financial crisis dummy (not shown in the chart) are also found to be statistically insignificant.



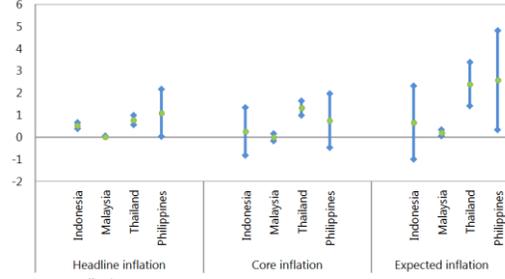
**Figure II.1. Summary of Estimated Coefficients in Policy Rules**

**Estimated Inflation Reaction Coefficients 1/**



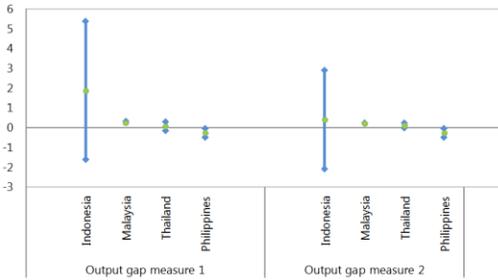
Source: IMF staff estimates.  
1/ The average coefficient estimates are represented by the green dots, while the range represents plus and minus one standard deviation. These are computed using bootstrap aggregation based on combinations of variables and 10,000 repetitions.

**Estimated Inflation Reaction Coefficients 1/**



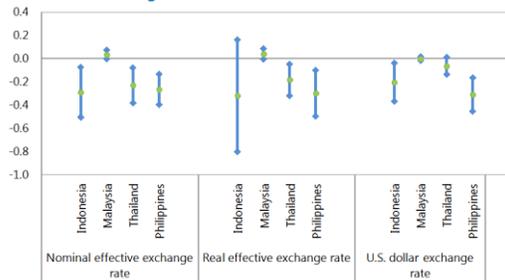
Source: IMF staff estimates.  
1/ The average coefficient estimates are represented by the green dots, while the range represents plus and minus one standard deviation. These are computed using bootstrap aggregation based on combinations of variables and 10,000 repetitions.

**Estimated Output Gap Reaction Coefficients 1/**



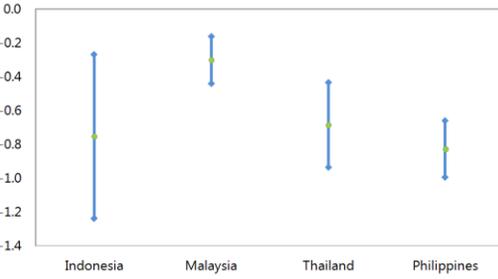
Source: IMF staff estimates.  
1/ The average coefficient estimates are represented by the green dots, while the range represents plus and minus one standard deviation. These are computed using bootstrap aggregation based on combinations of variables and 10,000 repetitions.

**Estimated Exchange Rate Reaction Coefficients 1/**



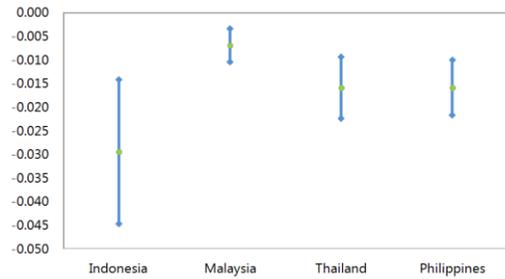
Source: IMF staff estimates.  
1/ The average coefficient estimates are represented by the green dots, while the range represents plus and minus one standard deviation. These are computed using bootstrap aggregation based on combinations of variables and 10,000 repetitions.

**Estimated Coefficients on Global Financial Crisis Dummy 1/**



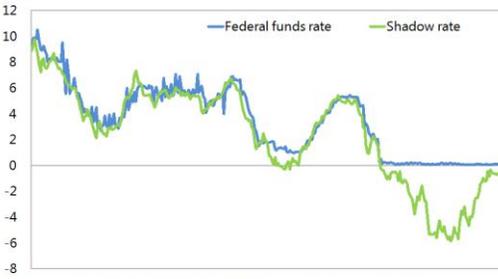
Source: IMF staff estimates.  
1/ The average coefficient estimates are represented by the green dots, while the range represents plus and minus one standard deviation. These are computed using bootstrap aggregation based on combinations of variables and 10,000 repetitions.

**Estimated Coefficients on VIX 1/**



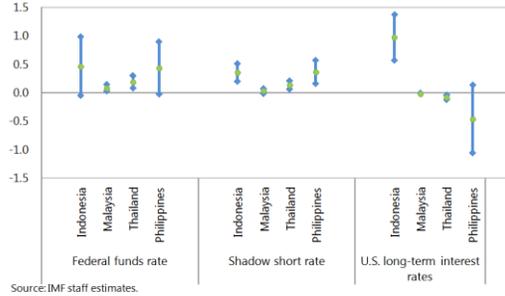
Source: IMF staff estimates.  
1/ The average coefficient estimates are represented by the green dots, while the range represents plus and minus one standard deviation. These are computed using bootstrap aggregation based on combinations of variables and 10,000 repetitions.

**Federal Funds Rate and the Shadow Rate (In percent)**



1/1/1989 11/1/1992 9/1/1996 7/1/2000 5/1/2004 3/1/2008 1/1/2012  
Sources: CEIC Data Co., Ltd.; and Krippner (2014).

**Estimated Reaction Coefficients to U.S. Interest Rates 1/**



Source: IMF staff estimates.  
1/ The average coefficient estimates are represented by the green dots, while the range represents plus and minus one standard deviation. These are computed using bootstrap aggregation based on combinations of variables and 10,000 repetitions.

**Output gap.** The output gap is insignificant except in the case of Malaysia, where a negative output gap of one percentage point is associated with a 25 basis point reduction in the policy interest rate. This finding, along with the results on the inflation rate, points to a greater emphasis on output rather than inflation in Malaysia.

**Exchange rate.** Previous studies, for example, Ostry and others (2012), have found a role for the exchange rate in the monetary policy decisions, even for emerging market economies with an inflation-targeting regime. Three alternative measures were considered: nominal and real effective exchange rates and the bilateral exchange rate against the U.S. dollar (all expressed as a deviation from a linear trend). The coefficient estimates are, on aggregate, statistically insignificant suggesting little role for the exchange rate in setting the policy interest rate in the ASEAN-5 countries.

**Global shocks.** A dummy variable for the global financial crisis is included for the peak period for the global financial crisis.<sup>4</sup> This variable is statistically significant with a large negative sign, ranging between 30bps for Malaysia and 75bps for Indonesia at the high end, and captures the additional reduction in policy rates outside of domestic considerations during this period. As an alternative, the VIX was included to capture periods of global uncertainty occurring both during the global financial crisis and during other periods. The VIX is generally found to be statistically significant and suggests that a 30 point increase in the VIX (for example, as occurred in September 2011) has been associated with a decline in policy rates between 10–45 bps.

**U.S. monetary policy.** The impact of U.S. interest rates and monetary policy is explored through the inclusion of one of three variables: the federal funds rate; a shadow federal funds rate; and 5-year Treasury bill rate. The Federal funds rate provides the conventional measure of U.S. monetary policy stance but, with rates at a near-zero rate since the end of 2008, cannot capture the role of unconventional monetary policy. This prompts the consideration of other measures including 5-year Treasury yields and a shadow short rate, computed by Krippner, 2014. The shadow short rate is computed using estimates from a two-state variable shadow yield curve and has historically tracked the actual federal funds rate very closely, prior to reaching the zero lower bound. Higher U.S. short-term interest rates and generally associated with higher policy rates in the ASEAN-5 countries, however, not unexpectedly, the estimated impact of higher short-term rates is greater when the shadow short-term rate is used. This variable is statistically significant at 5 percent for Indonesia and at 10 percent for Thailand and the Philippines. The implications of recent U.S. monetary policy are shown in Figure 10 (in main text) illustrating that U.S. monetary policy has put downward pressure on the policy rates which have been lower by as much as 2.5 percentage points in Indonesia but more recently the impact has narrowed.

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<sup>4</sup> The global financial crisis dummy is one between Q4:2008 and Q2:2009; and zero otherwise.

## Appendix III. The Fallout from Recent Capital Outflow Episodes

**The ASEAN-5 economies were hit hard by the financial shock waves at the time of the GFC and the 2013 “Taper Tantrum.”** More recently, financial volatility spiked again in the summer of 2015, owing to concerns about China’s growth outlook, the sharp decline in the Chinese stock market, and uncertainty about China’s new exchange rate regime. The impact of these episodes of financial turbulence differed across countries, and so did the policy responses. The fallout and policy responses associated with capital outflow episodes provide valuable lessons for the current juncture where EMEs including the ASEAN-5 are facing the prospect of a prolonged period of risk aversion among investors and risks of global financial volatility (IMF 2016a).

### Fallout from Recent Episodes of Financial Market Stress

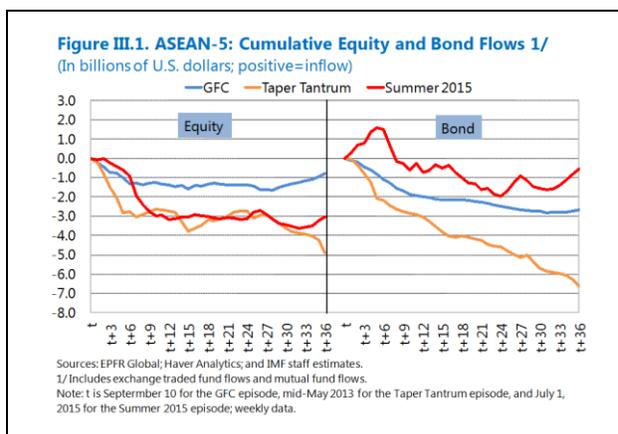
**The turmoil in financial markets following the bankruptcy of Lehman Brothers in 2008 had a dramatic impact on all ASEAN-5 economies.** In contrast, the taper tantrum shock was more intense in Indonesia than in the other four economies, amid investor concerns about the widening twin deficits and strong credit growth (Table III.1). This is consistent with the findings of Sahay and others (2014) that countries with strong fundamentals were less affected by the taper talks. During the financial turmoil of 2015, Malaysia and Indonesia—both major commodity exporters—experienced sharper pressure than the other ASEAN-5 economies, reflecting concerns over the fiscal and external positions amid plunging commodity prices, and political controversy in Malaysia.

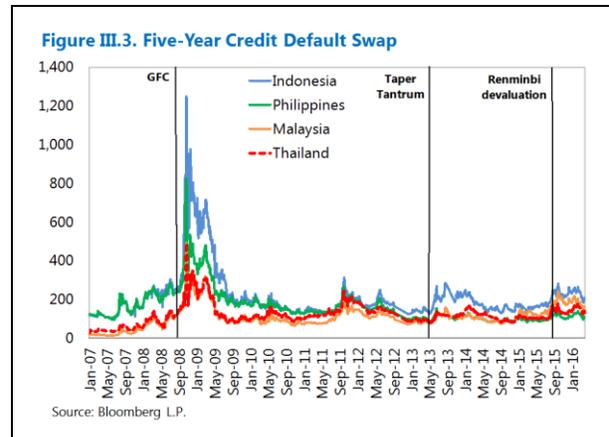
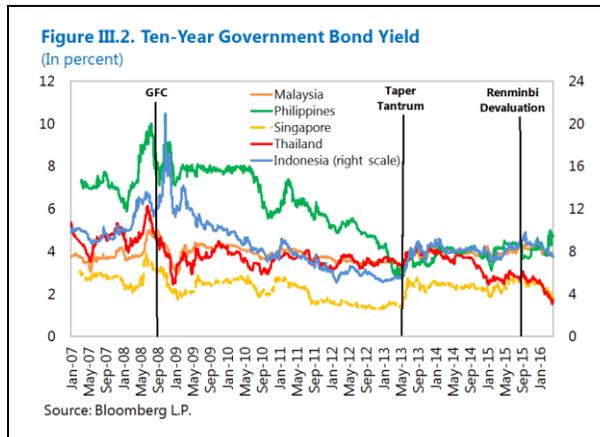
**Table III.1. ASEAN-5: Macroeconomic Fundamentals**

	Year	Indonesia	Malaysia	Philippines	Singapore	Thailand
Current account balance (In percent of GDP)	2008	0.0	16.5	0.1	14.4	0.3
	2012	-2.7	5.2	2.8	17.2	-0.4
	2014	-3.1	4.3	3.8	19.1	3.3
	2015	-2.1	2.9	2.9	19.7	8.8
Fiscal balance (In percent of GDP)	2008	0.1	-3.5	-0.1	6.4	0.3
	2012	-1.6	-3.8	-0.8	7.8	-0.4
	2014	-2.2	-2.7	0.6	3.3	3.8
	2015	-2.5	-3.0	-0.3	1.1	8.8
CPI (In percent, year-on-year)	2008	9.8	5.4	8.2	6.6	5.5
	2012	4.0	1.7	3.2	4.6	3.0
	2014	6.4	3.1	4.2	1.0	1.9
	2015	6.4	2.1	1.4	-0.5	-0.9
Oil exporter		Yes	Yes	No	No	No

Source: IMF, *World Economic Outlook* database.

- Capital flows:** All ASEAN-5 economies saw capital flow reversals in 2008:Q3-2009:Q1, with cumulative non-FDI outflows exceeding US\$90 billion, as nonresidents reduced their holdings of domestic assets. During the taper tantrum, nonresident portfolio investments fell, while other capital flows were less affected. Net portfolio flows to the ASEAN-5 economies were more severely affected during the taper tantrum than in the weeks following the GFC. Cumulative net portfolio outflows between June 2013 and March 2014 reached almost US\$20 billion, compared to an US\$8 billion outflows during September 2008-March 2009, according to EPFR data. Financial volatility in the summer of 2015 was associated with net equity portfolio outflows, which, cumulative over a seven months period, reached the same amount as in the taper tantrum episode. Initially, bond flows were not adversely impact by the renmimbi adjustment, as investors seemed to differentiate between equities—under stress after China’s stock market correction—and the debt market. Later on, though, bond flows started to retrench as well. Malaysia and Indonesia experienced the largest outflows, similar to emerging markets in other regions adversely affected by the down cycle in commodity prices and weaker growth prospects. Only in February-March 2016 did portfolio flows to the ASEAN-5 turned positive again.
- Equity markets:** stock prices fell sharply in all the ASEAN-5 countries during the GFC—more than 30 percent on average—between September 2008 and March 2009. In comparison, during the taper tantrum, the equity price declines were greatest in Indonesia, the Philippines, and Thailand (15 percent on average between June and August 2013), but more contained in Malaysia and Singapore, where prices fell by about 5 percent. Between August and September 2015, Indonesia and Singapore experienced a 12 percent drop in stock prices—the largest among the ASEAN-5 countries, with equity prices falling by 6–9 percent in Malaysia, the Philippines, and Thailand, with a rebound in the following months.
- Sovereign CDS spreads and government bond yields:** the surge in sovereign CDS spreads between September 2008 and February 2009 ranged from about 90 bps in the case of Singapore, to nearly 400 bps for Indonesia. During the taper tantrum Indonesia saw a much sharper rise in both sovereign spreads and government bonds yields than the other four countries—by 124 bps and 250 bps, respectively, between May and September 2013. During the 2015 summer turbulence, Indonesia’s government bond yields and sovereign CDS spreads widened again by more than 100 basis points. Malaysia’s sovereign CDS spreads also increased by about 100 basis points, while changes in spreads were much smaller in the other three economies reflecting concerns focused on commodity exporters.



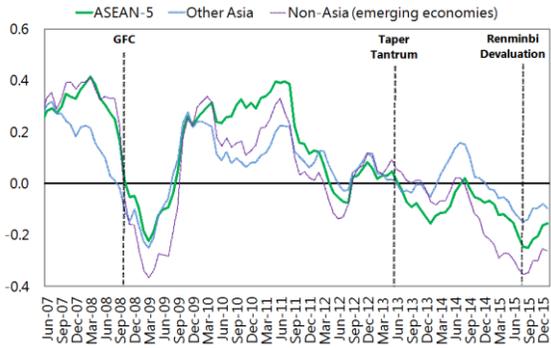


- Exchange market pressure:* Capital flow reversals resulted in exchange rate depreciation and reserve drawdown. An index combining changes in exchange rates and reserves points to significant pressure on all ASEAN-5 during the GFC, although lower than that experienced by non-Asia emerging economies (Figure III.4). The exchange rates in Indonesia and Malaysia came under intense pressure again between April 2013 and December 2015, with both the rupiah and ringgit losing 29 percent of their values against the U.S. dollar, and with Malaysia’s FX reserves declining by 32 percent. However, the exchange pressure was exacerbated by the collapse in oil prices as both Malaysia and Indonesia are major oil exporting countries.

**Figure III.4. Exchange Market Pressure Index**

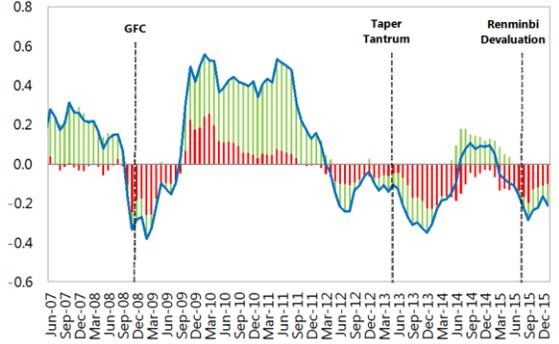
**Asia: Exchange Market Pressure Index**

(Change in U.S. dollar/LC exchange rate + change in reserves)



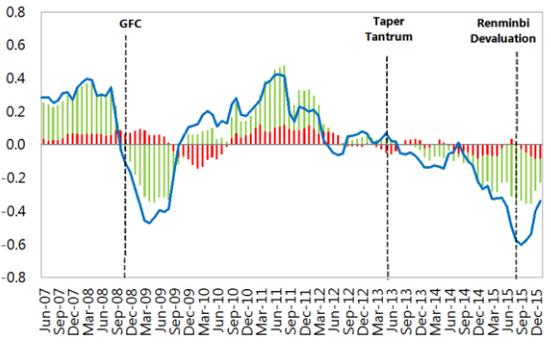
**Indonesia**

■ Percentage change in reserves ■ Percentage change in exchange rate — Total



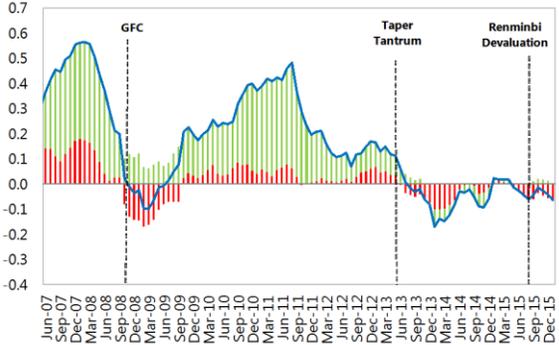
**Malaysia**

■ Percentage change in reserves ■ Percentage change in exchange rate — Total



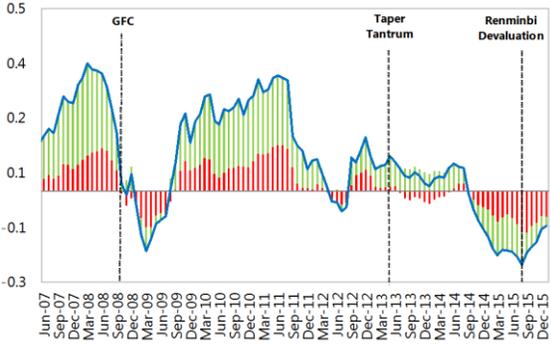
**Philippines**

■ Percentage change in reserves ■ Percentage change in exchange rate — Total



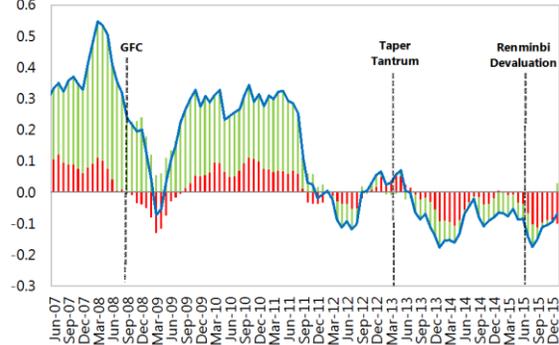
**Singapore**

■ Percentage change in reserves ■ Percentage change in exchange rate — Total



**Thailand**

■ Percentage change in reserves ■ Percentage change in exchange rate — Total



Source: Haver Analytics; IMF, *International Financial Statistics*; and IMF staff estimates.

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