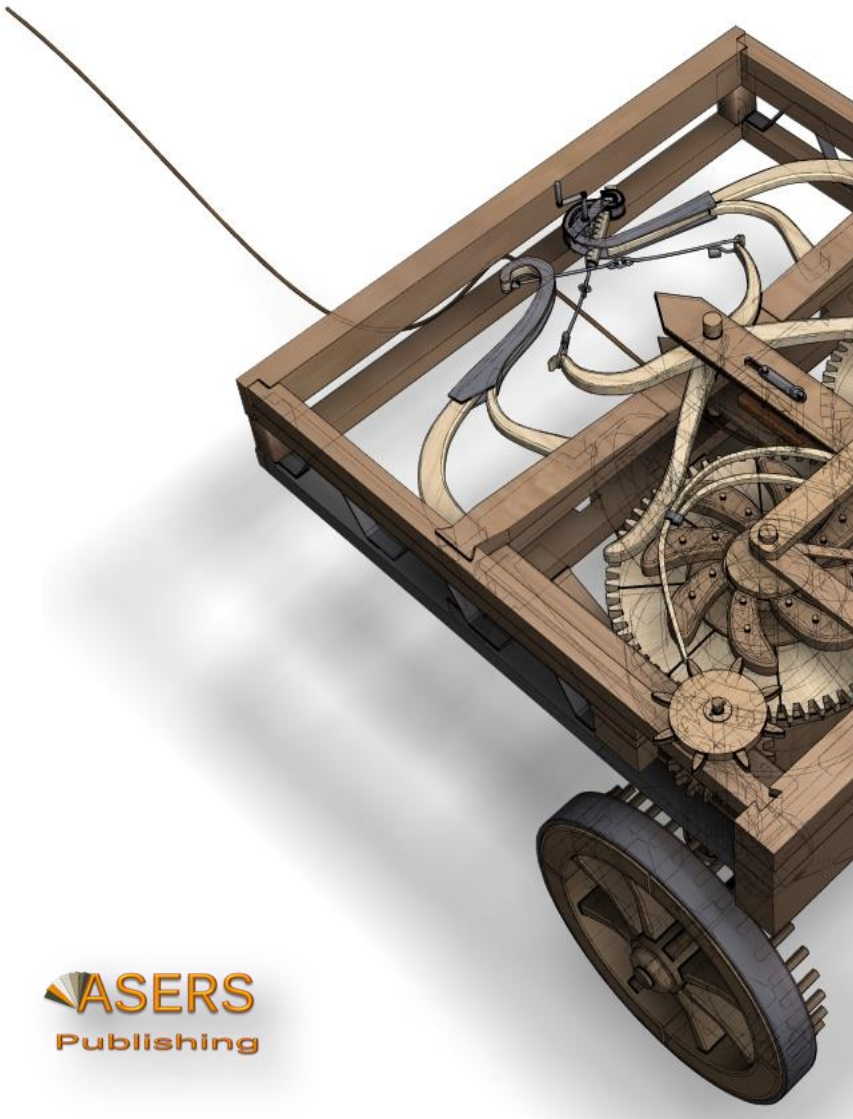
ASERS

Theoretical and Practical Research in Economic Fields



Biannually
Volume VII
Issue 1(13)
Summer 2016

ISSN 2068 – 7710
Journal **DOI**
http://dx.doi.org/10.14505/tpref

ASERS Publishing

is an advanced e-publisher struggling to bring further worldwide learning, knowledge and research. This transformative mission is realized through our commitment to innovation and enterprise, placing us at the cutting-edge of electronic delivery in a world that increasingly considers the dominance of digital content and networked access not only to books and journals but to a whole range of other pedagogic services.

In both books and journals, ASERS Publishing is a hallmark of the finest scholarly publishing and cutting-edge research, maintained by our commitment to rigorous peer-review process.

Using pioneer developing technologies, ASERS Publishing keeps pace with the rapid changes in the e-publishing market.

ASERS Publishing is committed to providing customers with the information they want, when they want and how they want it. To serve this purpose, ASERS publishing offers digital Higher Education materials from its journals, courses and scientific books, in a proven way in order to engage the academic society from the entire world.

Summer 2016
Volume VII
Issue 1(13)

ASERS Publishing
http://www.asers.eu/asers-publishing
ISSN 2068 – 7710
Journal's Issue **DOI**:
http://dx.doi.org/10.14505/tpref.v7.1(13).00

Contents:

Call for Papers
Volume VII, Issue 2(14), Winter 2016

Theoretical and Practical Research in Economic Fields

Many economists today are concerned by the proliferation of journals and the concomitant labyrinth of research to be conquered in order to reach the specific information they require. To combat this tendency, **Theoretical and Practical Research in Economic Fields** has been conceived and designed outside the realm of the traditional economics journal. It consists of concise communications that provide a means of rapid and efficient dissemination of new results, models and methods in all fields of economic research.

Theoretical and Practical Research in Economic Fields publishes original articles in all branches of economics – theoretical and empirical, abstract and applied, providing wide-ranging coverage across the subject area.

Journal promotes research that aim at the unification of the theoretical-quantitative and the empirical-quantitative approach to economic problems and that are penetrated by constructive and rigorous thinking. It explores a unique range of topics from the frontier of theoretical developments in many new and important areas, to research on current and applied economic problems, to methodologically innovative, theoretical and applied studies in economics. The interaction between empirical work and economic policy is an important feature of the journal.

Theoretical and Practical Research in Economic Fields, starting with its first issue, it is indexed in EconLit, RePEC, EBSCO, ProQuest, Cabell Directories and CEEOL databases.

The primary aim of the Journal has been and remains the provision of a forum for the dissemination of a variety of international issues, empirical research and other matters of interest to researchers and practitioners in a diversity of subject areas linked to the broad theme of economic sciences.

All the papers will be first considered by the Editors for general relevance, originality and significance. If accepted for review, papers will then be subject to double blind peer review.

Invited manuscripts will be due till October15th, 2016, and shall go through the usual, albeit somewhat expedited, refereeing process.

Deadline for submission of proposals: 15th October, 2016

Expected publication date: December, 2016

Website: www.asers.eu/journals/tpref/

E-mail: tpref@asers.eu

To prepare your paper for submission, please see full author guidelines in the following file: TPREF_Full_Paper_Template.doc, then send it via email at tpref@asers.eu.

Theoretical and Practical Research in Economic Field

DOI: http://dx.doi.org/10.14505/tpref.v7.1(13).03

Policy Rate Divergence in the ASEAN-4: Impact of Global Risk Perception and Financial Market Characteristics

Laura B. FERMO[1]
Central Bank of the Philippines, Philippines
lfermo@bsp.gov.ph

Suggested Citation:

Fermo, L. B. (2016). Policy Rate Divergence in the ASEAN-4: Impact of Global Risk Perception and Financial Market Characteristics. TPREF (Volume VII, Summer), 1(13): 30-52. DOI:10.14505/tpref.v7.1 (13).03
Available from: http://www.asers.eu/journals/tpref/curent-issue.

Article's History:

Received May, 2016; *Revised* June, 2016; *Accepted* July, 2016.

Acknowledgement:

The author gratefully acknowledges the financial support by the Japan Society for the Promotion of Science's (JSPS) Ronpaku Program. The author also wishes to thank Colin McKenzie, Felipe M. Medalla, and Akira Kohsaka for their helpful and constructive comments on earlier drafts of this paper.

Abstract:

Monetary policymakers want to know how much influence they can exert over market interest rates. Looking at how far and when benchmark market interest rates are deviating from policy rates provide them with a perspective of how the degree of influence of the central bank's policy rate over market interest rates changes over time, and help them understand what factors are causing the divergence. The focus and main contribution of this study is that for four small, open emerging market economies of the Association of Southeast Asian Nations (ASEAN), the gap between policy rates and market interest rates follows a Markov-type regime-switching process. In addition, the study finds that some domestic financial market characteristics—particularly the degree of foreign ownership of the relevant money markets, and global factors that drive foreign risk-taking and search for yield—particularly indicators of global risk perception are the significant determinants of the transition probabilities.

Keywords: Markov, regime-switching, ASEAN-4, monetary policy, divergence, global risk appetite, Trilemma

JEL Classification: E5, F31

1. Introduction

In this study, we would like to: establish that the gap between the policy rate and the short-term market interest rate in the case of the Philippines, Indonesia, Malaysia, and Thailand follow a Markov-type regime-switching process and test further whether the transition probabilities of the regime-switching in the rate gap for these economies are time-varying, by identifying what variables, either common to emerging markets such as measures of global risk appetite and US monetary policy, or idiosyncratic factors relating to the financial market characteristics of each economy, are driving the transition probabilities. We will use a Markov-Switching (MS) Regression model with time-varying transition probabilities (TVTP) based on Filardo (1994, 1998).

Establishing what factors are driving the switches in the rate gap can help policymakers understand why there are periods of divergence, and at the same time identify those indicators which would then be important to follow closely and possibly be used as early warning system or leading indicators to help anticipate periods of weaker influence versus periods of stronger monetary policy influence, or as part of an interest rate forecasting model. Our objective in this paper is to characterize the data on the rate gap, rather than explicitly model its

[1]Correspondence: Laura B. Fermo, Bangko Sentral ng Pilipinas (BSP), Room 513, 5-Storey Building, BSP Complex, Mabini corner P. OcampoSts., Malate, Manila, Philippines 1004. Email: lfermo@bsp.gov.ph

behavior. The paper goes as follows: Section 2 summarizes the literature in this area of study. Section 3 discusses the characteristics of financial markets in the ASEAN-4, the data used, and the empirical methodology. Section 4 presents and analyses the empirical results. In Section 5 we conclude and submit areas for future study.

2. Review of Related Literature

In theory, money market rates and Treasury bill yields are expected to be at a premium over overnight monetary policy rates reflecting term, liquidity, and credit or counterparty risk factors. This relationship reflects the interest rate channel which remains as the key transmission channel of monetary policy in emerging markets (EMs) (Mohanty and Turner 2008). For the purposes of this paper, the degree of influence or the effectiveness of monetary policy is represented conceptually by the gap computed as the policy interest rate less the benchmark interest rate identified for four ASEAN-4 economies (ASEAN-4), Indonesia, Malaysia, the Philippines and Thailand, and we term this gap as the rate gap. The closer or higher the benchmark interest rate is compared to the policy rate, the more effective monetary policy is in influencing market interest rates. Policymakers are not concerned about periods of close to zero or negative rate gaps because they are expected given term and the other risk factors we enumerated above. More importantly, low or negative rate gaps represent periods when the degree of influence of the central bank policy rate is the strongest.

However, it is during those periods when market interest rates fall below the policy rate - the high rate gap periods - when policymakers are most worried. Given that the relevant market interest rate acts as a benchmark for lending rates in the transmission process, a positive and high rate gap means that the impact of policy rates on lending rates are believed to be blunted. This is a concern for central banks because when market interest rates are below the policy rates, they could translate to lending rates which are lower than the levels which are consistent with the central bank's forecasts, its intended policy stance as well as its targets for policy objectives.

There is a girth of literature where the time series properties of short-term market interest rates are estimated. However, only a few studies such as Panigirtzoglou *et al.* (2000) and Affandi and Peiris (2012) have studied empirically the behavior of the divergence of market interest rates from the policy rates used by central banks. Panigirtzoglou *et al.* (2000) looked at the volatility and persistence of the divergences between short-term market interest rates and policy rates using Brenner *et .al.'*s (1996) class of models that combine a model of the levels and a volatility GARCH model of market interest rates for Germany, Italy and the United Kingdom. More recently, Affandi and Peiris (2012), assessed whether the gap between the central bank policy rate and Treasury bill rates (but computed as Treasury bill rates less the policy rate) has blunted the effectiveness of the interest channel of monetary policy for the Philippines. They, too, utilized a single-regime GARCH model where the conditional variance process accommodated both volatility clustering and dependence on the level of interest rate as in Panigirtzoglou *et al.* (2000) and Brenner *et al.* (1996). Affandi and Peiris (2012) also estimated the persistence and volatility of the deviation of market rates from policy rates, the determinants of the divergence of market rates from policy rates, and the interest rate transmission mechanism and its relation to prevailing lending conditions in the Philippines. Based on their findings, liquidity, portfolio flows, fiscal factors and the supply of government securities appeared to be driving the rate gap for the Philippines, but proposed that global factors such as monetary policy in advanced economies and global liquidity may also be driving the divergence.

In contrast to these two studies which utilized single-regime GARCH models, we relax the assumption of a single regime in this study, in favor of a Markov-type regime-switching regression model for the rate gap. Regime-switching models in general allow us to model data generated by shifting or changing economic mechanisms within a single unified model, and are therefore more complex, flexible structures. To account for the possibility that the economic relationships that generate the gap between the policy rate and the market interest rate undergo a finite number of changes over the sample period, the coefficients in this model are different in each regime. Although the regimes are unobserved, the coefficients can be estimated, and probabilistic statements can be made about the relative likelihood of the occurrence of the regimes, conditional on given information set (Gray 1996).

The Markov-switching mechanism was first considered by Goldfeld and Quandt (1973). Hamilton (1988, 1989) introduced the fixed transition probability (FTP) Markov-switching model and applied it for use in dynamic macroeconomic analysis. As an extension of the FTP Markov-switching model to incorporate time-varying transition probabilities, Filardo (1994) developed a first-order Markov process with state-dependent transition probabilities governing the switching between regimes. In this time-varying transition probability (TVTP) Markov-switching model, transition probabilities are allowed to vary with variables such as the strength of the economy, deviations of fundamentals from actual values, and other leading indicators of change (Filardo 1998). His work on

the Markov-type regime-switching TVTP model was first applied to business cycle analysis for the US. As of this writing, there is yet no published study in the literature delving on the implication of changing global risk appetite and financial market idiosyncrasies on the divergence between the policy rate and the benchmark interest rate. The application of Markov-switching regression as an empirical technique for data on the rate gap and its relationship with global factors and financial market characteristics are also relatively new and more so for emerging Southeast Asia as a group.

In identifying potential variables that could account for the switching in the rate gap, the literature points out that while central bank objectives affect the level and direction of the policy rate, financial market characteristics affect the *sensitivity* of asset market yields to international investment flows. On the other hand, global factors such as the perception of risk on EMs that is prevailing in global markets, US monetary policy and global liquidity affect the *attractiveness* of these asset markets to foreign investors. Because these two classes of factors affect either the supply, the demand or the price of the relevant asset, both affect movements in benchmark yield rates and hence, the rate gap. Cerutti *et al.* (2015) found in their study that financial market characteristics, such as liquidity in the recipient country and composition of the foreign investor base, rather than macroeconomic fundamentals, most robustly explain some emerging countries' sensitivity to global factors affecting capital flows. The taper-tantrum in May-June 2013 illustrated that not all EMs are equally exposed to the same changes in global conditions. Meanwhile, Ahmed et al (2015), Forbes and Warnock (2012) and Ghosh *et al.* (2014) have documented the importance of global factors such as advanced economy interest rates and global risk appetite in affecting capital flows to small open economies. Cerutti *et al.* (2015) noted as well that various episodes of large, on and off waves of non-resident capital flowing to and from EMs over the past decade has re-emphasized the importance of common factors in driving global capital flows. Milesi-Ferretti and Tille (2011) and Rey (2015) are in consensus on the significant impact of US monetary policy, the supply of global liquidity, and global risk perception in helping explain the flow of foreign capital into asset markets of EMs. What is central in all the literature we have discussed above is that various global factors including measures of risk perception, as well as the idiosyncratic characteristics of the relevant asset markets, are the relevant variables in understanding the movements in the rate gap of the ASEAN-4 because they are the main drivers of non-resident capital flows that affect both the policy rate and the benchmark interest rate and hence, the rate gap.

It is interesting to note further, that the monetary policy objectives of the central bank could also have an effect not only on the policy rate per se, but also on either the sensitivity of relevant asset markets or the attractiveness of these asset markets to international flows, or both. This is because the central bank's decision among three objectives: monetary independence, exchange rate stability, and financial openness has some bearing on not only the policy rate itself, but also on the wedge between the policy rate and the market interest rate. In understanding the behavior of the rate gap and the factors that are driving its recurring cycle of convergence and then divergence, it is therefore helpful to look at it within the context of the Impossible Trinity principle. For one, an important factor to consider in understanding the movements in the rate gap in emerging economies is that what is "chosen" by the domestic financial market as the benchmark rate with which to price loans - the direct channel by which policy interest rates are transmitted into lending rates and ultimately into prices and output in Ems - are the yields for assets which are attractive to both resident investors as well as non-resident ones. As long as this asset market is liquid enough and volumes are adequate, it becomes the natural "benchmark" interest rate. For the same reason, this benchmark asset market is potentially highly responsive to non-resident investment flows.

The theory of the Impossible Trinity or the Trilemma in fact usually requires an extremely high degree of substitutability between domestic and foreign assets, but this perfect substitutability is rarely seen in the real world. What we do see, however, is that the yields of assets which are invested upon by both residents and non-residents alike is the most responsive to both monetary policy and global factors so that often, asset markets with this characteristic is where we can observe the Trilemma story coming into play. We can say descriptively that the constraints of the Impossible Trinity become binding during periods of positive and high rate gaps in the relevant asset markets, whereas the Impossible Trinity constraints become loosened during those periods of close to zero or negative rate gaps or when the benchmark rate is close to or higher than the policy rate. Periods of high global risk premia in emerging economies act as a "natural wall" against disruptive capital flows, so that in this environment, impossible trinity constraints have been loosened because the third side of the Trilemma triangle—perfect capital mobility—appear to be irrelevant because high risk premia acts as some form of a natural barrier against volatile or yield-seeking foreign capital. Meanwhile, during periods of low global risk premia when this natural wall disappears, the reverse is true.

The literature on global financial market analysis also noted that an important repercussion of both the Asian financial crisis (AFC) and the global financial crisis (GFC) relevant to our study at hand is that the financial system of emerging Asian economies became entrenched in an environment where some kind of a risk-on, risk-off (RoRo) cycle in short-term foreign investment flows prevails. Grenville (2011) recognized this as well, describing how global investors have been taking advantage of the opportunities from interest rate differentials in emerging countries in their favor, in waves of confidence with retreats or sudden stops when confidence evaporates and the rational investor exits, analogous to a bank run. He adds that these sudden changes in assessment are explicable in terms of global investors' imperfect knowledge, so that shifts in assessment can be triggered by the arrival of news, or by other investors' actions. In the end, these leave emerging countries as the reluctant hosts to non-resident short-term capital flows, which cause volatility not only to exchange rates, but to asset prices as well. Indeed, global investors appear to be caught in a binary view of the world and as a result, their appetite for risk rises and falls over time.

Risk-on, risk-off behavior is particularly true for portfolio funds, where periods of perceived low financial risk encourage investors to take risk, therefore creating a risk-on situation, and periods of perceived high financial risk cause investors to take less risk, creating a risk-off situation.[2] RoRo could cause investors to behave in a herd-like manner and is more likely to occur in times of economic uncertainty.[3]Hence, the switching between high and low appetite for emerging market bonds and securities began to happen more frequently and in greater intensity in the fallout to the GFC, and the subsequent adoption of unconventional monetary policy by the US Federal Reserve, the European Central Bank, and the Bank of Japan and, more recently, with the uncertainty about the timing of exits from such policies. The 2008 GFC, for example, is generally viewed as a risk-off year, when global investors reduced risk by selling existing risky positions and moving money to either cash positions or low to no-risk positions, such as US Treasury bonds. Meanwhile, during 2009-2010, global funds were invested in higher-risk instruments in search of better yields, and when EMs showed a higher degree of resilience and registered better economic and inflation performance than the advanced economies, global funds were transferred into emerging financial markets as a result - a risk-on period.

We can then relate these three themes together: the regime switching in the rate gap, the risk on, risk off or RoRo cycle in global investor appetite, and the Trilemma story. The regime-switching in the rate gap is potentially driven by changing global risk perception which, in turn, is driven by the risk-on, risk off behavior of short-term foreign capital. There is some kind of "natural wall" provided by high global risk perception during risk-OFF episodes, which discourages the influx of these disruptive, short-term foreign capital flows especially those of the carry trade variety into relevant EM financial markets. Meanwhile, during episodes when global risk premia are low - the risk - O Nepisodes—this natural wall is gone and the Trinity constraints become binding, but only in the asset markets that are accessible and attractive to speculative, short-term non-resident flows, such as portfolio capital. In this sense, we can find unique regimes in EMs when the Impossible Trinity story is prevailing not in the entire financial system, but only in those bond markets which are both *attractive* and *sensitive* to non-resident portfolio flows.[4]Policy-overwhelming international capital flows and its implications to monetary policy are central to the Impossible Trinity[5] story.

Aizenman and Ito (2014) and Ito and Kawai (2014) both shared how for small, open emerging economies, the Trilemma policy constraints are binding such that given the varying degrees of free capital mobility in these countries, they are wrought with the challenges of disruptive capital flows to monetary policy. Based on a case study by Hsing (2012), there is a Trilemma situation in the Philippines, Malaysia, and Singapore, but he did not find evidence for a similar situation in Indonesia and Thailand. Hsing (2012) noted further that different

---

[2] Geordie Clarke, Financial Times, http://lexicon.ft.com/Term?term=risk-on,-risk-off

[3] Aimee Steen, Financial Times, *Ibid*.

[4] Foreign direct investment and other long-term flows have an indirect impact on benchmark interest rates, and an entirely different impact on policy rates. As these types of capital flows are also driven by a separate set of global indicators, the dynamics and effects of these types of flows are outside of the purview of this study, and we reserve its study for future research.

[5] The purest or "strict" view of the policy constraints under the impossible trinity is that countries that have barriers to capital mobility and a floating exchange rate can achieve a substantial degree of monetary policy independence, while countries with a fixed exchange rate but an open capital account would attain a lower level of monetary policy independence (Obstfeld *et al.* 2005). A more nuanced view, however, is that the impossible trinity represents trade-offs, with an economy gaining greater monetary independence as it either allows more exchange rate flexibility or as it prohibits some types of international capital flows permanently or restricts them during certain periods or episodes (Rummel 2014).

macroeconomic policy combinations prevailed in these three economies over time, rendering the ability to switch to different policy combinations in order to deal with major economic events, such as a crisis.

3. Description of the data and empirical framework used

a. The Data

In this study, we use the available monthly data from January 2000 to May 2015 for each of the four member countries of the ASEAN-4—the Philippines, Indonesia, Malaysia, and Thailand. In measuring the rate gap that we will be using in the estimation, we have identified the appropriate short-term benchmark interest rates for the four economies being reviewed based on stylized facts in the literature as well as through central bank consultations describing the asset markets which are most liquid and attractive to both resident and nonresident investors. Meanwhile, the main policy rates were obtained from each of the ASEAN-4 central banks. As discussed in the previous section, the rate gap represents the degree by which the monetary authority maintains its influence or control over the market interest rates prevailing in each of the four economies: the lower the rate gap, the higher the degree of influence of monetary policy over short-term market interest rates and vice versa. All interest rate data series were taken mainly from the CEIC database augmented by respective central bank data, as needed. Financial market data were either in monthly or quarterly frequency obtained largely from the Asian Bonds Online database of the ADB, augmented by central bank data, where applicable. Data available, however, were not uniform in frequency and in terms of the number of observations, and can vary depending on each specific data and for each country. Appendix Table 1 shows in detail further information on data definitions and specific sources and series names used in the empirical estimation, as well as the expected signs for each variable in the empirical exercise.

The interest rate gap

Policy interest rates are expected to anchor money market rates, whereas Treasury bill (Tbill) yields act as benchmarks for deposit and loan rates. As noted earlier, money market rates and Tbill yields should be higher than overnight policy rates in theory, reflecting term, liquidity and credit risk factors. In the ASEAN-4, however, there were specific periods when benchmark interest rates have become significantly lower than the policy rate. Figure 1 displays the movements of the policy rate, the benchmark interest rate and a risk premium measure in each of the four countries between January 2000 and May 2015. We can see from Figure 1 how the divergence between the main policy rate and the short-term benchmark interest rate in the ASEAN-4 has evolved over time. The gap between the dotted line and the solid line in the figure is the rate gap, while the bars are the levels of sovereign risk premium in basis points. What we can surmise from interest rate gap data is that the magnitude of the divergence and convergence between the policy rate and the benchmark interest rate and the timing of the regime-switching in the rate gap appear to vary over time for the four economies, so that the dynamics behind rate gap movements could be different for each economy. This variation and the potentially different impact of global factors and idiosyncratic financial market characteristics on the rate gap would have been lost under panel data estimation. This holds support to our use of a Markov-switching, time-varying transition probability model in order to understand the dynamics and drivers of the regime-switching rate gap for each individual country in the ASEAN-4.

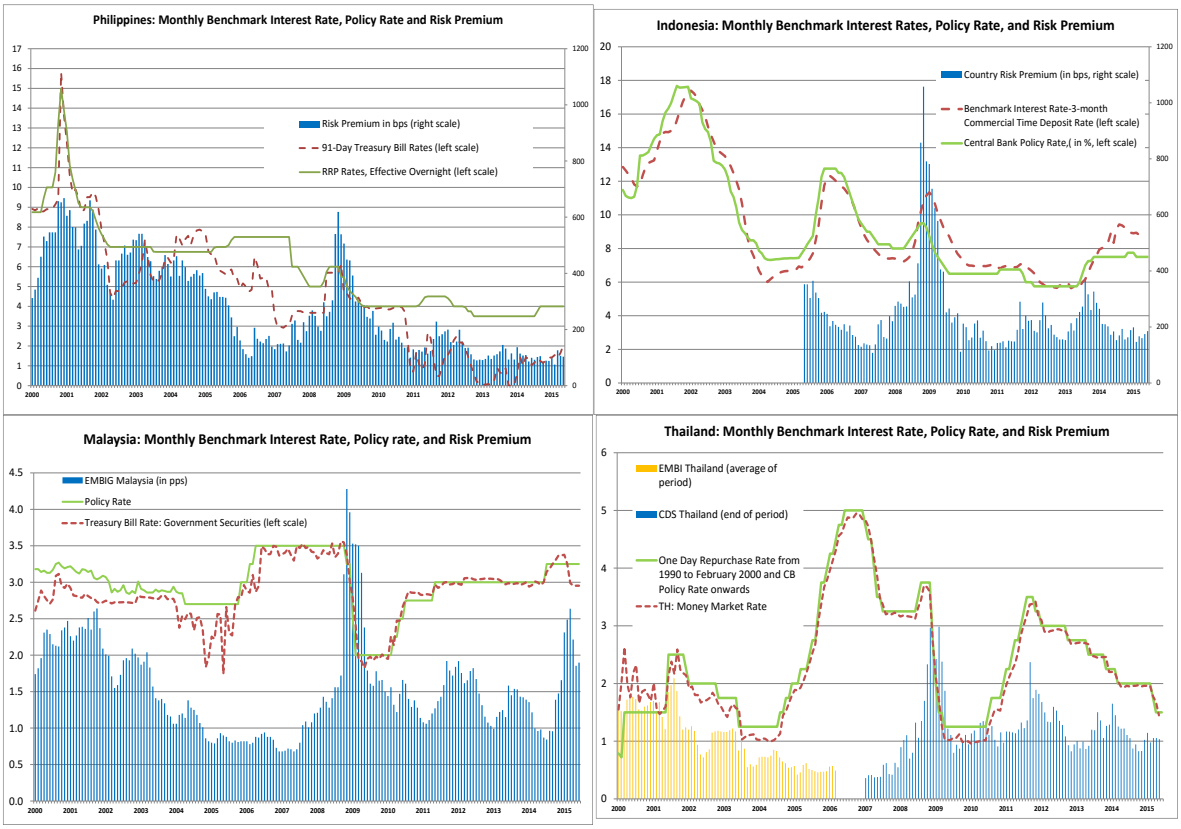


Figure 1 - The Rate Gap vs. Country Risk Premium in the ASEAN-4

For the Philippines, for example, what is observable from Figure 1 is that there are two distinct alternating cycles of larger and then smaller or zero to negative gap between the policy rate and the short-term benchmark interest rate, associated with increasing country risk premiums versus periods of declining country risk premiums, respectively. This trend is also shared by Indonesia where recently, money market rates have fallen well below the policy rate. In Malaysia, Sharifuddin and Ling (2014) pointed out that due to the surge in portfolio flows in 2007, and then again in 2010 and 2011, the entire yield curve fell below the overnight policy rate. In Thailand, the decline in spread of country sovereign bond prices to risk free bond prices (CDS spreads) in 2005, and the lower Emerging Bond Market Index+ (EMBI+) spreads for Thailand in 2007 and then again in 2009 to 2011 was associated with one-month Tbill rates falling below the policy rate.

Financial market characteristics

Data on financial market characteristics, primarily the investor profile of local currency bonds as well as foreign currency bonds which we have hypothesized in the previous section as potential variables affecting the sensitivity of the rate gap, are available either a monthly or quarterly frequency. The majority of the data available begins in January 2000 and ends in March 2015 and were obtained primarily from the Asian Development Bank's (ADB) Asian Bonds Online database with url www.asianbondsonline.adb.org, as well as the central banks and finance ministries in the case of countries whose data are not available in this website.

Data for the Philippines' foreign holdings of local currency-denominated (LCY) bonds from the Department of Finance is available from 2005 to 1Q2015, and non-residents' vs. residents' holdings of foreign currency denominated (FCY) bonds is available from the Central Bank of the Philippines (BSP) from 2006 to 2015 Q1. The frequency of the available data is quarterly for the more recent period and annual for earlier years. Meanwhile, data for Indonesia, Malaysia and Thailand on the foreign holdings of LCY bonds are reported in AsianBondsOnline.com as a quarterly series. As such, we used the ECOTRIM© program to interpolate all three sets of data into a monthly frequency, using unvaried methods. We recognize here there are potential drawbacks of such an interpolation method.

Based on data for the size and domestic financing profile of asset markets in each of the four economies, we see that the Philippine asset market is the thinnest in terms of the volume of domestic financing composed of domestic credit, bonds, or equity among the ASEAN-4, followed by Indonesia. This is especially so for the bond market, as the Philippine bond market amounts to only US$D21.0 billion in 2000 and US$104 billion in 2014,

which is about 28% and 21% of total domestic financing, respectively, compared to Indonesia's US$52.8 billion in 2000 and US$123 billion in 2014 (or about 32.0% and 12.3% of the total),Malaysia's US$68.7 billion in 2000 and US$316 billion in 2014 (or about 22.0% and 25% of the total) and Thailand's US$31.0 billion in 2000 and US$281.3 billion in 2014 (or 18.0% and 27% of the total). This observation will be especially relevant in the analysis of empirical results later on.

Meanwhile, in terms of the investor profile of LCY bonds, banks accounted for the biggest share in the total holdings of LCY bonds historically for the Philippines, Indonesia, Malaysia and Thailand. More recently, however, bank holdings have been on a declining trend, accompanied by a trend increase in foreign holdings of government securities. Graphical inspection would in fact show us some sort of an inverse relationship between foreign holdings and commercial bank holdings—while foreign holdings were on the rise, commercial bank holdings of government securities (GS) were on a declining trend in all four economies. Nevertheless, in the case of both the Philippines and Indonesia, commercial banks still account for the biggest share of LCY bond ownership as of 2014 and early 2015.

In terms of the investor profile of foreign-issued and foreign currency-denominated government securities or FCY bonds, we find that historically, the Philippines had the biggest level of FCY debt in US$ value among the ASEAN-4. Indonesia, however, has recently surpassed it with the steepest climb in the levels by the first quarter of 2015. FCY bonds issued by the government as a share to total issuance is also the largest in the Philippines at about 80 percent historically, followed by Indonesia at about 50 percent. In Malaysia, the government's share of FCY bond issuance has shrunk to about 5.0 percent of the total by Q1 2015, where as banks and financial institutions' share climbed to about 55.0 percent for the same period. Corporate account for the biggest share of FCY bond issuance in Thailand, peaking at about 65.0 percent in 2009, and falling to around 40.0 percent in Q1 2015. The share of the corporate sector in FCY, is also high in Malaysia, following Thailand, at about close to 40.0% on the average.

Global factors

In Section 2, we proposed that global factors are expected to influence the *attractiveness* of the benchmark bond markets to global investors for the ASEAN-4. The global indicators we have used were taken mainly from Bloomberg, the International Monetary Fund (IMF) online database, the CEIC Economic database, the Emerging Portfolio Fund Research, Inc. (EPFR) Web interface, as well as the Institute of International Finance (IIF) online database, using data series available from 2000 to Q1 or March 2015.

We computed and/or obtained several indicators for changes in global risk perception associated with the emerging market assets under review. One is the differential between the interest rate on 10-year dollar-denominated sovereign debt of each country and the interest rate on US 10-year Treasury Notes, which has become a benchmark for most emerging countries in tracking global markets' view of country risk vis-à-vis safe haven assets, such as US Treasuries. Another more commonly used indicator of global risk perception in financial market analysis, and among the most readily available, consist of market information extracted from JP Morgan's Emerging Market Bond Index (EMBI)spreads as well as the spreads of country sovereign bond prices to risk-free bond prices(CDS), both available from Bloomberg. Changes in the market-implied default probabilities extracted from EMBI+ Global Index and the EMBI Index per country, as well as the 5-year CDS premia on sovereign debt are often used in the literature and by market participants as an indirect measure of the market's perception of sovereign risk. We also tested for the significance of HSBC's Risk On – Risk off (RORO) index in the analysis. This index takes the rolling correlations between the daily returns of the 34 assets they monitor around the world and combines them into a single index. HSBC constructed the index by using principal component analysis to decompose the 34 asset return time series into 34 principal components, which are mutually uncorrelated variables that explain the observed asset returns.

What we finally used in the empirical estimation as the main country-specific risk premium data, which also captures the RoRo, or risk-on, risk-off episodes of global investments in the empirical analysis for each of the ASEAN-4, is the 10-year dollar-denominated sovereign bond rate minus 10-year US Treasury Note for the Philippines and Indonesia, and the EMBI Index spreads for Malaysia. For Thailand, we have combined the CDS data which is available from January 2000 to February 2006 only, with the EMBI Thailand data, which is available from January 2007 to March 2015, in order to have a longer, more useful data series to be used as the risk premium indicator specific to Thailand. The EMBI+ Global spreads as well as HSBC's RORO Index (HSBC Global Research 2012), meanwhile, serve as global indicators of risk perception that is common to all four emerging economies.

Apart from the individual countries' and global risk premium data, the other global factors we tested as possible repressors of the regime-switching in the rate gap as well as determinants of the transition probabilities consist of global indicators that represent US monetary policy, measures of global liquidity or bond flows going into each emerging market, as well as global volatility indices relevant to emerging markets. These include the US real Federal Reserve Fund rates, the US 10-year Treasury as well as US secondary market yields, EPFR's Bond Flows data going into the Philippines, Indonesia, Malaysia and Thailand and the Chicago Board Options Exchange (CBOE)'s Volatility Index[6] or VIX data.

Further information on the sources, any transformation on the data used, as well as the expected signs for the variables used as regress or of the rate gap or as determinants of the transition probabilities in the study are summarized and presented in Appendix - Table 1.

b. Empirical Framework: The Markov Regime-Switching Regression Model

Following Hamilton (1988) and Filardo (1994, 1998), we illustrate the Markov regime-switching regression process by assuming that the random variable of interest, g_t, follows a process that depends on the value of an unobserved discrete state variable S_t. We assume there are 2 possible regimes, and the process is said to be in state or regime m in period t when $S_t = m$, for m = 1, 2. The switching model then assumes that there is a different regression model associated with each regime. We assume an autoregressive process of the following form:

$$g_t - \mu_t(m) = \varphi_m (g_t - \mu_t(m)) + \varepsilon_t m = 1,2 \quad (1)$$

Where $\mu_t(m)$ is given by:

$$\mu_t(m) = \beta_m, \text{ for } m = 1,2 \quad (2)$$

and ε_t is an identically, independently (i. i. d.) and normally distributed random variable. From (13), if $\varphi_1 = \varphi_2$the coefficient of the AR (1) process will be regime independent. If $\varphi_1 = \varphi_2 = 0$, there will just be regime-dependent constants in the regression model. It is assumed further that the probability of being in a regime depends on the previous state, that is, it is governed by a first-order Markov process[7] so that

$$P(S_t = j \mid S_{t-1} = i) = P_{ij}(t) \quad \text{for } i = 1, 2; j = 1,2. \quad (3)$$

The Basic Model assumes that these probabilities are time invariant, so that $P_{ij}(t) = P_{ij}$ for all t. Clearly, the transition probabilities must satisfy $P_{i1} + P_{i2} = 1$. The transition matrix governs the random behavior of the state variable, and is given by

$$P = \begin{pmatrix} P(S_t = 1 \mid S_{t-1} = 1) & P(S_t = 2 \mid S_{t-1} = 1) \\ P(S_t = 1 \mid S_{t-1} = 2 & P(S_t = 2 \mid S_{t-1} = 2 \end{pmatrix} = \begin{pmatrix} \mathbf{P}_{11} & 1 - \mathbf{P}_{11} \\ 1 - \mathbf{P}_{22} & \mathbf{P}_{22} \end{pmatrix} \quad (4)$$

Our Basic MS-Regress Model refers to the combination of (2) and (4). We are also considering time-varying transition probabilities (or TVTP) model where the transition probabilities may postulated as being functions of some of the exogenous or predetermined variables, so that the transition probabilities may vary with time. In this case, instead of (4), the stochastic process on S_t can be summarized by the transition matrix:

$$P(S_t = s_t \mid S_{t-1} = s_{t-1}, z_t) = \begin{pmatrix} \mathbf{P}_{11}(z_t) & 1 - \mathbf{P}_{11}(z_t) \\ 1 - \mathbf{P}_{22}(z_t) & \mathbf{P}_{22}(z_t) \end{pmatrix} \quad (5)$$

Where the history of the economic indicators variables is $z_t = \{z_t, z_{t-1},\}$. $P_{11}(z_t)$ and $P_{22}(z_t)$ are given by:

[6] VIX is a trademarked ticker symbol for the CBOE Volatility Index, a popular measure of the implied volatility of S&P 500 index options calculated by the Chicago Board Options Exchange (CBOE). Often referred to as the fear index or the fear gauge, the VIX represents one measure of the market's expectation of stock market volatility over the next 30-day period.

[7] See also Filardo (1998) and Kim and Nelson (1999) for a more thorough analysis of the model and its estimation.

$$\mathbf{P}_{11}(z_t) = \frac{exp(z_t\alpha_1)}{1+exp(z_t\alpha_1)} \quad (6)$$

$$\mathbf{P}_{22}(z_t) = \frac{1}{1+exp(z_t\alpha_2)} \quad (7)$$

Where α_1 and α_2 are the vectors of coefficients to be estimated. When $\alpha_1 = \alpha_2 = 0$, the model reverts to being a model with time invariant transition probabilities.

It should also be noted that given (6) and (7):

$$\frac{\partial \mathbf{P}_{11}(z_t\alpha_1)}{\partial z_t} = \alpha_1 \mathbf{P}_{11}(z_t\alpha_1)(1-\mathbf{P}_{11}(z_t\alpha_1)) \quad (8)$$

$$\frac{\partial \mathbf{P}_{22}(z_t\alpha_2)}{\partial z_t} = -\alpha_2 \mathbf{P}_{22}(z_t\alpha_2)(1-\mathbf{P}_{22}(z_t\alpha_2)) \quad (9)$$

So that provided all the transition probabilities are nonzero, $0 < \mathbf{P}_{11}(z_t\alpha_1) < 1$ and $0 < \mathbf{P}_{22}(z_t\alpha_2) < 0$, then the sign of α_1 and $\frac{\partial \mathbf{P}_{11}(z_t\alpha_1)}{\partial z_t}$ are the same, while the sign of α_2 and $\frac{\partial \mathbf{P}_{22}(z_t\alpha_2)}{\partial z_t}$ are the opposite of one another. Of course,

$\frac{\partial \mathbf{P}_{12}(z_t\alpha_1)}{\partial z_t} = -\frac{\partial \mathbf{P}_{11}(z_t\alpha_1)}{\partial z_t}$, and $\frac{\partial \mathbf{P}_{21}(z_t\alpha_2)}{\partial z_t} = -\frac{\partial \mathbf{P}_{22}(z_t\alpha_2)}{\partial z_t}$.

In addition, the regression component of (1) can be extended to

$$\boldsymbol{\mu}_t(m) = \boldsymbol{\beta}_m + X_t'\boldsymbol{\gamma}_m + W_t'\boldsymbol{\delta}, \quad \text{for } m = 1,2. \quad (10)$$

Where $\boldsymbol{\gamma}_m$ and $\boldsymbol{\delta}$ are vectors of coefficients to be estimated, and X_t and W_t are vectors of explanatory variables. As can be seen from (8), the coefficients on X_t (W_t) are regime dependent (independent). Our Markov-Switching TVTP model refers to the combination of (5), (6), (7) and (8).

Equations (10) and (5) show how information can enter the model in two ways, one directly through the regression component and another indirectly through the transition probabilities, respectively. We hypothesize that indicators of global risk perception and other global factors as well as on financial market characteristics per country could affect both the transition probabilities and the regression component.

It is natural to want to test the null hypothesis that there is 1 regime against the alternative of 2 regimes, that is, to test whether there are any changes in the regime at all. However, the likelihood test of this hypothesis fails to satisfy the usual regularity conditions, because under the null hypothesis, some of the parameters of the model are unidentified. The best alternative is to use and compare the Akaike Information Criterion (AIC) for the MS Regressions for the models assuming 1 and 2, and this is what we have done in this study. The models with 2 regimes presented in section 4 dominated the similar model with only 1 regime in each of the four countries.

4. Presentation and analysis of results

All models are estimated using EViews 8. We begin the analysis with a discussion of our Basic MS Regress results, by looking at the coefficients and indicators of model performance of the basic Markov-switching models per country presented in Table 1 below. We denote this model as "Basic" because in this regression, we first look at the basic parameters without considering possible determinants for the transitional probabilities. The results are arranged so that the first regime represents the high rate gap regime, when the divergence between the policy rate and the benchmark interest rate is large. Conversely, regime 2 is the regime when the rate gap diminishes, or when the divergence between the policy rate and the benchmark interest rate is small or even

negative. We see this in the estimates of the intercepts β_1 and β_2 which, in our basic specification, are estimates of the average rate gap for regimes 1 and 2, respectively. Under this model specification, the Philippines recorded the highest average rate gap during regime 1, or the high rate gap regime, at 2.60%t over the 2000-2015 periods. Indonesia recorded the second highest average rate gap at 0.69%, followed by Malaysia and then Thailand.

During regime 2, or the low rate gap regime, the Philippines still had the highest positive average rate gap at 0.21%, but the rankings for the other countries changed. The Philippines' average rate gap is now followed by Malaysia at 0.02%. Indonesia and Thailand both recorded a negative average rate gap under regime 2. This means that for both Indonesia and Thailand, not only does the level of the benchmark interest rate approach or converge towards the level of the policy rate in regime 2, the low rate gap regime, but the market rates in fact surpasses the policy rates, thus resulting in the negative average rate gap levels. Among the four economies during the period in review, therefore, the Philippine policy rate appears to have the comparatively weakest influence over market interest rates, as it recorded the highest average rate gap for both regime 1 and regime 2, and always surpassing the second in rank and the rest of the ASEAN-4 countries by a significant amount. The average rate gap in Malaysia and Indonesia, are both relatively low, which is an indication that based on our definition of the rate gap, the central bank policy rate appears to have a relatively stronger influence or control over the benchmark interest rate in Malaysia and Thailand, compared to that in the Philippines and Indonesia.

Table 1. Results from the Basic MS Regression Model of Conditional Mean

	Variables	Philippines	Indonesia	Malaysia	Thailand
Number of Observations		**185**	**185**	**185**	**185**
Coefficients in Regression					
Constant Term, Regime 1	β_1	2.60	0.69	0.33	0.12
z-statistic		28.26***	10.45***	15.98***	9.63***
Constant Term, Regime 2	β_2	0.21	-0.99	0.02	-0.57
z-statistic		2.12**	-13.90***	1.88*	-12.53***
Parameters in Transition Probabilities					
Constant Term, Staying Probability in Regime 1	a_1	3.25	3.30	3.02	5.36
z-statistic		6.07***	6.12***	4.62***	4.94***
Constant Term, Switching Probability from Regime 2 to 1	a_2	-3.16	-3.45	-3.53	-4.01
z-statistic		-5.82***	-5.55***	-6.57***	-2.28**
Transition Probabilities					
Probability of staying in Regime 1	P11	0.96	0.96	0.95	1.00
Probability of switching to Regime 2, when already in Regime 1	P12	0.04	0.04	0.05	0.00
Probability of switching to Regime 1, when already in Regime 2	P21	0.04	0.03	0.03	0.02
Probability of staying in Regime 2	P22	0.96	0.97	0.97	0.98
Expected Durations, in number of months					
Regime 1		26.90	28.11	21.55	214.47
Regime 2		24.59	32.57	35.27	56.33

Source: Author's estimates.

APPENDIX TABLE 1: Data Definitions and Expected Signs

		Expected Sign of the Variable as Regressor	Expected Sign of the Variable as Driver of P11 and P21 transition probabilities	**Philippines**	**Indonesia**	**Malaysia**	**Thailand**
				2000-2015 May	2000-2015 May	2000-2015 May	2000-2015 May
The Dependent Variable: Rate Gap = Benchmark Interest Rate - Main Policy Rate of CB							
Sources: central bank websites, CEIC, Bloomberg	Benchmark Interest Rate			91-Day Treasury-bill (Tbill) Rates	3-Month Commercial Time Deposit Rate	Treasury Bill Rate: Government Securities	Money Market Rate
	Series Name			TBIL91	STRATE	STRATE1	STRATE3
	Main Policy Rate			Reverse Repurchase (RRP) Rate of the Bangko Sentral ng Pilipinas (BSP)	Central Bank Policy Rate, end period	Intervention Rate (or the 3-month Interbank Rate) for 2000 to March 2004; Overnight Policy Rate from April 2004-2015 latest	Policy Rate, month end
	Series Name			CBPOLRT	CBPOLRT	CBPOLRT	CBPOLRT
	Interest Rate Gap			INTGAP1	INTGAP2	INTGAP1	INTGAP2
Independent Variables Tested and Used in the MS-Regress Model with Conditional Mean and TVTP							
Financial Market Characteristics							
Sources: AsianBondsOnline.com, Bangko Sentral ng Pilipinas, PHI Department of Finance	Foreign Holdings of LCY: as % of total holdings of LCY and in Levels	+	+	FORLCY	FORLCY, FORLCYLEV	FORLCY, FORLCYLEV	FORLCY, FORLCYLEV
NOTE: Data series from AsianBondsOnline for Indonesia, Malaysia and Thailand are quarterly, so that they were interpolated using ECOTRIM into monthly data using Univariate methods; For the Philippines, data from 2005 to 2013 are annual from the Department of Finance (DOF), and 2014 to latest are either quarterly or monthly. In cases when available data is quarterly or annual for the Philippines, they were interpolated into monthly series using ECOTRIM, Univariate methods.	Foreign Holdings of GS; Foreign Holdings of Tbills in Levels	+	+	FORGSLEV	FORGSLEV, FORTBILEV	FORGSLEV, FORTBILEV	FORGSLEV, FORTBILEV
	LCY owned by Banks as % of Total	-	-	LCYBANK	LCYBANK	LCYBANK	LCYBANK
	FCY total outstanding in levels (USD Billion)	+	+	FCYTOTLEV	FCYTOTLEV	FCYTOTLEV	FCYTOTLEV
	FCYRES in levels from DOF	-	-	Resident holdings of FCY			
	FCYNONR in levels from DOF	+	+	Non-Resident holdings of FCY			
Indicators of Global Factors	*Indicators of per Country Risk/Return Perception*						
Sources: Bloomberg and AsianBondsOnline.com	Country Risk Premium (10-Year Sovereign Rate - US 10-Year Treasury Note)			RISKPR1	RISKPR	RISKPR	RISKPR
	EMBI Global per country and EMBI+ for PHI	-	-	EMBIPHIP, EMBIFPHI	EMBIINO	EMBIMAL	Combined EMBITHA and CDSTHA
	CDS per country	-	-	CDSPHI	CDSINO	CDSMAL	
	HSBC Bond Return per country	+	+	HSBCRET	HSBCRET	HSBCRET	HSBCRET
	Other Global Indicators						
	Real US Fed Funds Rate: USRealRt	-	-	USREALRT	USREALRT	USREALRT	USREALRT
	10-Year US Bond Yield Rate	-	-	USTENNOTE	USTENNOTE	USTENNOTE	USTENNOTE
	10-Year US Secondary Market Rate	-	-	USTENSEC	USTENSEC	USTENSEC	USTENSEC
	US Inflation	-	-	USINFLRT	USINFLRT	USINFLRT	USINFLRT
	Chicago Board Options Exchange (CBOE) Volatility Index or VIX, end of period, or period average	-	-	VIXEOP/ VIXAVE	VIXEOP/ VIXAVE	VIXEOP/ VIXAVE	VIXEOP/ VIXAVE
	EMBI+ Global for Emerging Markets	-	-	EMBGLOB	EMBGLOB	EMBGLOB	EMBGLOB
	HSBC's RORO Index, which takes the rolling correlations between the daily returns of the 34 assets identified and combines them into a single index. HSBC constructs the index by using principal component analysis (PCA) to decompose the 34 asset return time series into 34 principal components (PCs), which are mutually uncorrelated variables that explain the observed asset returns.[a]	-	-	RORO	RORO	RORO	RORO
	Monthly Change in the Cross-border bond flows from the Global area and the Emerging Markets area, respectively, going into the Philippines, Indonesia, Malaysia, and Thailand taken from the Equity Bond Money Market Balanced Specialty Fund Flows (EPFR) Global online database	+	+	FLOBONGLOB FLOBONEM	FLOBONGLOB FLOBONEM	FLOBONGLOB FLOBONEM	FLOBONGLOB FLOBONEM
Dummy Variables used in the MS Regress Regime 1 Estimated Smoothed Probabilities charts per country	Changes in the Trilemma Indexes of greater than or equal to 20 basis points (bps) by Aizenman, Chinn and Ito (2013), 2000-2014						
	Risk premium peaks and troughs based onCountry Risk Premium data for the Philippines and Indonesia, EMBI Index spreads for Malaysia and Thailand and CDS spreads for Thailand, 2000 - 2015						

[a]HSBC Global Research. Currency Strategy from Currency Weekly, 17 April 2012.

If we examine the probabilities that the rate gap will stay in regime 1 when it is already in regime 1, $P_{11,}$ it is the highest for Thailand at 0.995 or almost 1.0 when rounded off. This is influenced by the outcome of the estimated smoothed regime probabilities, where Thailand recorded only one switch in 2001 from the low rate gap regime to the high rate gap regime, and no other switch was estimated by the model. It also follows that the expected duration of regime 1 is highest for Thailand's rate gap, at 214.5 months, whereas the expected duration for regime 2 is still the highest for Thailand compared to the other three countries, estimated at 56 months. The expected duration for regime 1 in Indonesia is at 28 months, followed by the Philippines at 27 months and Malaysia at 21.6 months. Meanwhile, Indonesia has the second highest P_{11}, at 0.964, followed closely by the Philippines at 0.963 and then Malaysia at 0.953.

The estimated transition probabilities for all four economies to stay in regime 2 when it is already in regime 2, P_{22}, are all high as well—all in the 0.96 to 0.98 level. The estimated switching probabilities, meanwhile, show that Malaysia has the highest probability of shifting to regime 2 when it is in regime 1, at 0.046 followed by the Philippines at 0.037, and then Indonesia at 0.036. Thailand has the lowest P_{12}result.When we look at the estimated probability of switching to regime 1 when it is already in regime 2, we see that the highest probability is for the Philippine rate gap, which could be interpreted to mean that this country tends to stay in the high rate gap regime, regime 1, or move towards the high rate gap regime, when it is already in regime 2. In terms of estimated expected duration, regime 1 or the high rate gap regime tends to last the longest in Indonesia at 28 months, while it tends to last for 26 months in the Philippines. Meanwhile, regime 2 or the low rate gap regime is expected to last the longest in Malaysia and Indonesia, at 35.3 and 32.6 months for both economies, respectively.

We proceed to look into the timing of the regime switches in the rate gap of the ASEAN-4 economies by presenting estimates of the smoothed regime probabilities from our basic MS-Regress Model in Figure 3. It can be observed that the four economies experienced regime switches at different times over the period of our study. Whereas this model specification detected seven (7) Markov-type regime switches in the Philippines, it detected six (6) Markov switches each in Indonesia and Malaysia, but only one (1) regime switch in 2001detectedin Thailand. The high rate gap periods - those months when the transition probability for Regime 1, the high rate gap regime, is close to, or is at exactly 1.0, and the low rate gap periods - those months when the transition probability for Regime 2, the low rate gap regime, is close to or is at exactly 1.0, for each ASEAN-4 economy are depicted in Table 2.

As a supplementary step in the empirical analysis, we also compare the timing of the regime switches by superimposing two of the most important variables—significant Trilemma changes and the changes in global risk perception—to see how they match graphically. One may recall that in the literature review, we proposed a connection between the Trilemma story, the RoRo periods of global risk appetite, and the high rate gap vs. low rate gap regimes. We have decided to include this graphical analysis of dummy indicators against the regime switches as a way to verify this connection because the Trilemma indexes are estimated in annual terms, so that the annual frequency does not allow us to test it directly as a determinant of the transition probabilities within the MS Regress methodology itself. The most updated and readily available indicator of significant movements along the Impossible Trinity triangle, reflecting changes in at least one, two or all of the three main objectives of a central bank, is based on the estimated Trilemma indexes from Aizenman *et al.* (2013) available via http://web.pdx.edu/~ito/trilemma_indexes.htm for the data series covering 2000 to 2014. For our purposes, we constructed a dummy variable that has the value of one (1) for periods when there were any changes greater than or equal to 20 basis points in absolute value terms in the level of one, two or all of the three indexes comprising the main index: Exchange Rate Stability Index, the Monetary Independence Index, and the Financial Openness Index, and zero (0) otherwise.

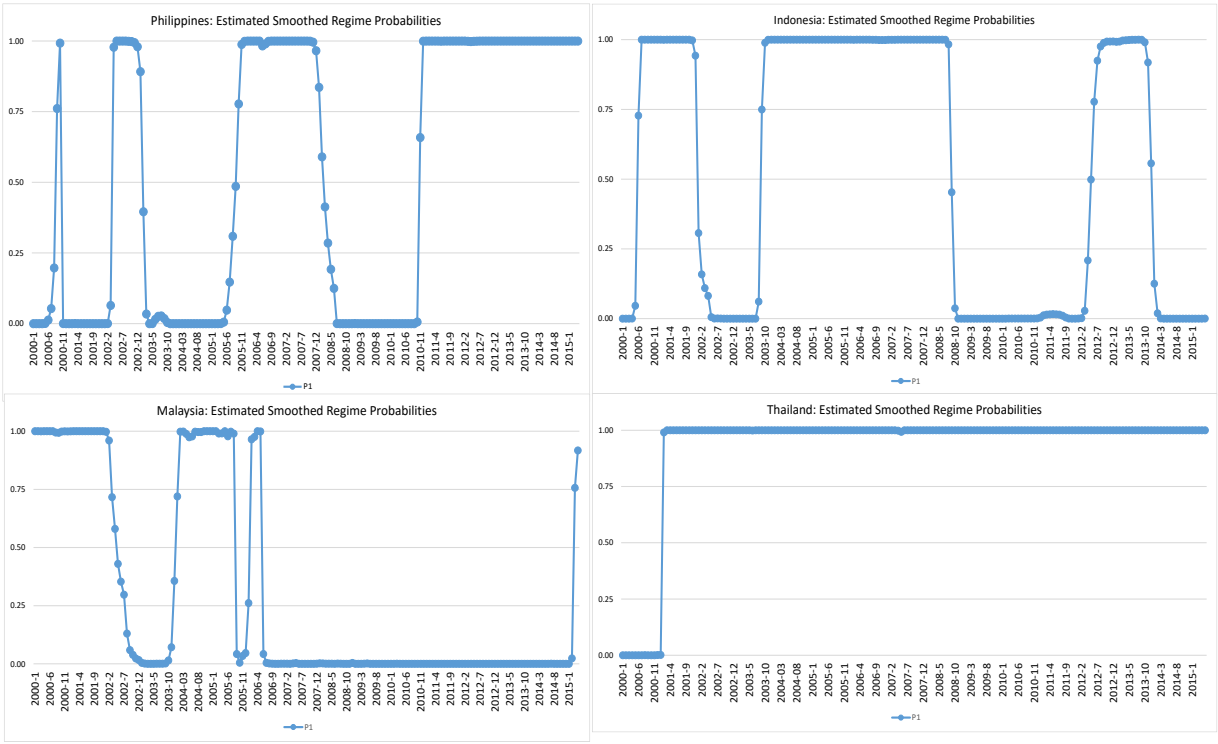


Figure 3 - Estimated Smoothed Regime Probabilities from the Basic MS-Regress Model

Table 2. HIGH RATE GAP AND LOW RATE GAP PERIODS			
Philippines	Indonesia	Malaysia	Thailand
Regime 1: High Rate Gap periods			
Oct 2000	Aug 2000 to Jan 2002	Jan 2000 to Mar 2002	Apr 2001 to May 2015
Jun 2002 to Jan 2003	Dec 2003 to Aug 2008	Mar 2004 to Aug 2005	
Nov 2005 to Apr 2008	Aug 2012 to Dec 2013	Mar to May 2006	
Jan 2011 to May 2015		May 2015	
Regime 2: Low Rate Gap periods			
Jan to Jul 2000	Jan to May 2000	Jul 2002 to Nov 2003	Jan 2000 to Jan 2001
Nov 2000 to Feb 2002	May 2002 to Aug 2003	Nov to Dec 2005	
May 2003 to Jul 2005	Dec 2008 to Apr 2012	Aug 2006 to Feb 2015	
Aug 2008 to Oct 2010	Apr 2014 to May 2015		
Source: Author's estimates			

Another dummy variable we have chosen to include in our graphical analysis is that which marks the periods when the risk premium measure per country have recorded peaks and troughs, which acts as our indicator of risk-on and risk-off behavior in global risk perception. We have constructed this dummy variable to have the value of one (1) for the month marking a peak or a trough in the County Risk Premium data (10-Year sovereign yield rate minus 10-Year US Treasury yield rate for the Philippines and Indonesia, and the EMBI Index spreads for Malaysia, and the combination of EMBI Index spreads and CDS spreads for Thailand), and zero (0) otherwise. As with the case of the Trilemma index dummy variable, plotting these indicators as dummy variables alongside the regime probabilities by country allows us to conduct a preliminary assessment whether the timing of

the regime switches we obtained from the Markov model are detected by, or associated with, the changes in the Trilemma indexes and the risk-on, risk-off events indicated by each variable.

From Table 3 and Figure 4, it can be seen that both the risk premium dummy variable and the Trilemma index dummy variable are associated with at least two regime switches per country, especially so for the Philippines, Indonesia and Malaysia. The risk premium peak and trough dummy indicators are most associated with the regime switches, as it coincides with five out of the seven switches for the Philippines, and with three of the regime switches for both Indonesia and Malaysia, but none for Thailand. Trilemma indexes, nonetheless, are annual indexes, so that by design there would expectedly be fewer matches or association with the rate gap regime switches, the estimation of which involved monthly data. Nevertheless, we see at least two matches between the regime-switches and the significant changes in the Trilemma Indexes for the first three countries.

Across the four ASEAN-4 economies, the timing of the regime switches as well as of the high rate gap regimes versus the low rate gap periods does differ, but there are also some common switches among them. This finding is a reflection of the fact that global factors common to these emerging Asian economies, such as changes in global risk perception on EMs in general, could affect the rate gap of all four countries at the same time, so that there would be periods when the timing of the regime switching could be identical. At the same time, however, the magnitude and timing of the impact of global indicators can differ across the four countries being reviewed and can vary over time. This indicates that there must then be other idiosyncratic factors which are driving as well whether a Markov-type regime switching will occur in one country or not for that period.

Table 3. TIMING OF THE REGIME SWITCHES AND ASSOCIATED CHANGES IN GLOBAL RISK PERCEPTION AND MONETARY OR OTHER POLICIES				
Regime Switches per Country	Associated Monetary and Other Policy Changes or Global Shocks[a]	Comparison with Dummy Variables on Risk Premium Peaks and Troughs and Trilemma Changes		
Philippines		Risk Premium Peaks dummy	Risk Premium Troughs dummy	Trilemma Changes dummy
Aug to Sep 2000	In early 2000, the BSP decided to shift to inflation targeting.			
Nov 2000	In late 2000, the BSP was confronted with the challenges of dealing with severe market turbulence in the events leading up to the removal of then President Joseph Estrada, including a massive loss of confidence and pressure on the Philippine peso.	Sep 2001		
March to May 2002	The BSP finally implemented the inflation targeting framework by January 2002. In Sep 2002, the rediscount window had been liberalized to allow a generalized and uniform access to the facility by all sectors of the economy at market rates, reorienting it to be used for money supply management (complementing open market operations) instead of selective credit allocation.		May 2002	2002
Feb to Apr 2003	The current account shifted to a surplus beginning in 2004, and has remained in surplus to this time.		Aug and Nov 2003	2004
Aug to Oct 2005	The EVAT Law was enacted in May 2005--a signal to global investors of sustained fiscal reforms; the current account shifting from historically negative balance into a surplus beginning in 2004 largely from sustained OF remittances, the emerging BPOs**, and a growing international reserve base .	May 2005	Apr 2005	2005
May to Jul 2008	2008-2009 Global Financial Crisis (GFC) with EMBI Philippines Spreads reaching a peak in December 2008.	Dec 2008		
Nov to Dec 2010	Philippine GDP Growth has begun to accelerate after the GFC, and at a rate even higher than its neighbors. Given constraints on issuance on its own securities, and its limited holdings of government securities for use as collateral in its reverse repurchase transactions, the BSP nearly exhausted its holdings and relied increasingly on other instruments such as nontradeable Special Deposit Accounts--the levels for which peaked during 2010-2011. On 28 October 2010, the BSP further amended the FX regulatory framework to keep FX transactions attuned to current economic conditions.		Dec 2010	2010
Indonesia				
Jun to Jul 2000	In 1999, a new central banking law enacted establishing the independence of Bank Indonesia (BI), setting of the inflation target, and the shift from base money targeting to interest rate targeting; Big Bang fiscal decentralization formally implemented in 2001.			
Feb to Apr 2002	July 2005: the reference rate changed to the overnight cash rate; implementatio of the BI rate through open market operations.	Jul 2005		
Sep to Nov 2003	Bank Indonesia and the national government established an Inflation Management Team in 2004 to implement an integrated policy roadmap.			
Sep to Nov 2008	2008-2009 GFC with EMBI Indonesia Spreads reaching a peak in November 2008.	Nov 2008	Apr 2007	2007 and 2008
May to Jul 2012	Beginning mid-2010, Indonesia added macroprudential measures to manage capital flows and safeguard financial system stability within its monetary policy framework.		Oct 2010	2010 and 2011
Jan to Mar 2014	When the taper tantrum hit in mid-2013, BI rapidly unwound the term deposit facilities with banks, particularly in the June-July 2013 period. Bank Indonesia also raised the secondary reserve requirement (RR) in September 2013 (fulfilled by banks' holding of treasury and BI securities) from 2.5 percent to 4.0 percent, to be phased in by December 2013.	Aug 2013	Jul 2014	2013
Malaysia				
Apr to Jun 2002		Oct 2002	Apr 2002	
Dec 2003 to Feb 2004	Malaysia undertook successive stages of foreign exchange liberalization measures beginning in 2004. The New Interest Rate Framework was also implemented in 2004.[b]	May 2004		2004
Sep to Oct 2005	July 2005: BNM moved to a managed float; Easing of restictions on capital flows; liberalization of restrictions on international transactions, leading to the accumulation of foreign assets by private entities as well as reserves. During the GFC in 2008-2009, the reduction in capital inflows in large part offset by repatriation of domestic capital abroad. Large sales by foreign investors were absorbed with minimal impact on domestic yields.			
Jan to Feb 2006	As a key enhancement to the breadth of the		December 2006	2006
Jun to Jul 2006	BNM's monetary policy instruments is the		January 2007	
Mar to Apr 2015	With the 2014 budget approved in October 2013, Malaysian authorities have continued to impose a series of targeted, gradual, and escalating Macroprudential Policies (MAPs), which have been mainly directed at speculative purchases of homes and unsecured credit.	Mar 2015	July 2014	2013
Thailand				
Feb to Mar 2001	Coming from a managed float under the IMF Program, the BOT announced the adoption of its inflaton targeting framework in 2001, implementing monetary policy by influencing short-term money market rates via the policy rate.*	Aug 2001		2000

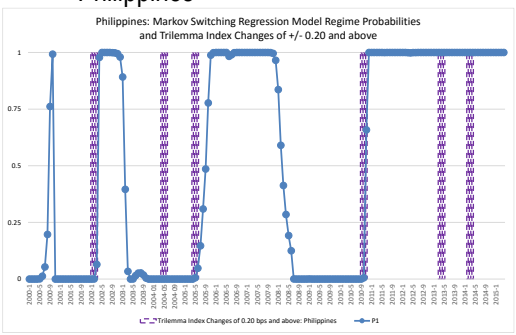
[a] The table includes only a general listing of the most prominent or major policy changes or shocks; The author does not claim it to be a comprehensive listing.

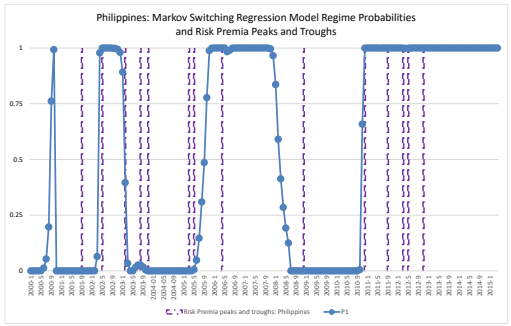
[b] Please see Sharifuddin et. al. (2014), Appendix 3, for a complete listing of the foreign exchange liberalization measures implemented by BNM in 2004.

* From May 2000 to January 2007, the policy rate was the 14-day repurchase rate. Effective January 2007, the policy rate has been the 1-day repurchase rate.

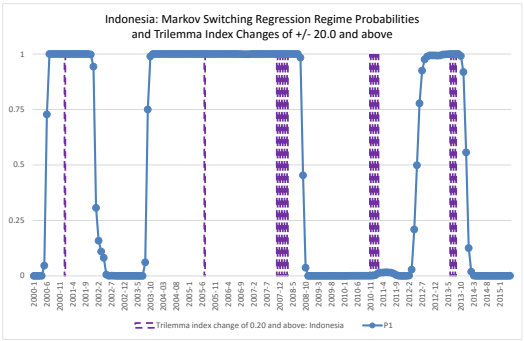
Sources: Regime switches are based on Author's estimates; Policy changes and shocks are based on materials from Central Bank websites such as the BNM's Annual Reports, IMF Article IV Reports and Selected Issues Papers 2010-2015, Asian Development Bank and the AsianBondsOnline.com, and the Bank for International Settlements.

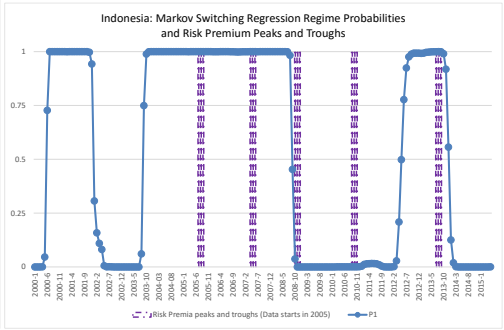
Philippines



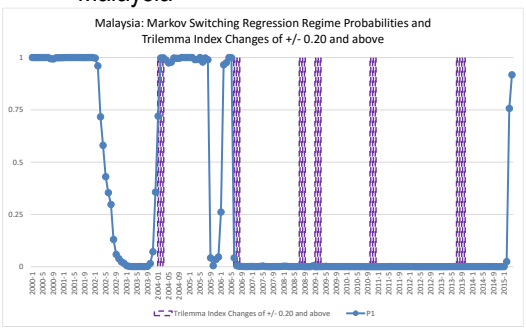


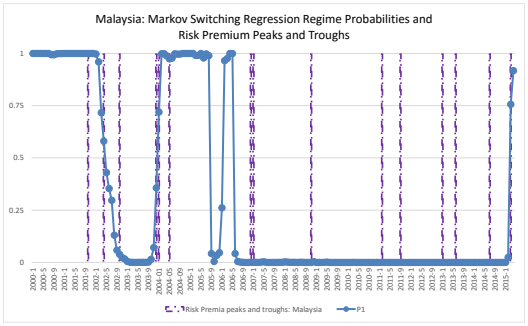
Indonesia



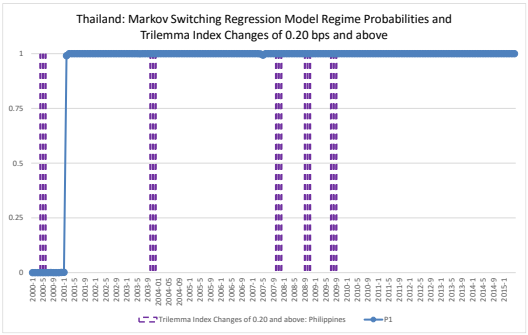


Malaysia





Thailand



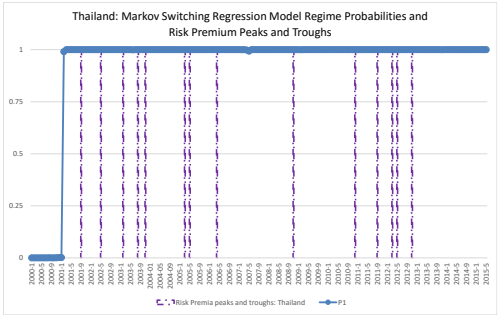


Figure 4 - Estimated regime 1 probabilities from the basic model and comparison with dummy indicators

One of the most interesting regime switches is the one detected in 2008, common to both the Philippines and Indonesia. This outcome is not surprising as the impacts of the global financial crisis (GFC) were of such scale, magnitude and coverage that it wrought havoc in emerging Asian countries' financial markets. The GFC affected the monetary and financial policies and interest rate-setting in central banks as well as the prices of, and returns to, assets which are accessible to foreign funds—generally leading to a narrowing of the rate gap and expectedly triggering a switch from the high rate gap to a low rate gap regime. During 2008, in fact, all four

economies recorded a peak in their respective risk premium indicators based on Figure 2, as the global perception of risk on emerging economies rose at that time–a risk-OFF episode. As we had proposed, high risk premia acts as a "natural wall" that effectively shielded off the flow of speculative capital, and this is achieved even without any change in capital controls or any movement in the Trilemma index particularly in terms of policies relating to financial market openness or capital mobility.

Other common switches which were detected by the estimated smoothed regime probabilities were in 2000 and 2003 for the Philippines and Indonesia, 2002 for the Philippines, Indonesia and Malaysia and in 2005 for the Philippines and Malaysia. On these occasions, the risk premium dummy variable series we had utilized marked either a peak or a trough in risk premia levels for these periods, except for Indonesia in 2000 and Malaysia in 2005. Interestingly, the year 2000 for Indonesia, and the year 2005 for Malaysia marked important milestones in the monetary policy framework of these economies, so that the regime switching may have been driven by these policy changes even without significant movements in the country risk premia (see Table 3). Additionally, both 2002 and 2005 are also associated with positive changes in the monetary and other financial policies in the Philippines, Indonesia and Malaysia which could have either directly affected the level of the rate gap—either via the policy rate or via the benchmark interest rate—or indirectly by reducing the level of global risk perception attached to these economies and opening up its domestic asset markets to foreign investment flows and hence driving down the returns—thus affecting the rate gap in two ways. We also see the MS Regress model detecting very recent switches in 2014-2015 for Malaysia and Thailand. Both switches coinciding with the risk premier peaks and troughs dummy indicator, as well as changes or movements in the Trilemma Indexes of these two economies for these periods.

Based on Table 3 and Figure 4, one result that deserves attention is that in contrast to the case for the Philippines and Indonesia, the MS-Regress model for both Malaysia and Thailand did not detect a switch in 2008, which we would expect to be the case as well for these two emerging economies. When we look at the regime probabilities for both Malaysia and Thailand in Figure 2, it appears as if either the level of the rate gap has effectively shielded itself from the effect of global factors, or that financial market characteristics were static or unchanged, remaining stable all throughout 2006 to 2014. During the GFC, the reduction in capital inflows in Malaysia was reported to have been largely offset by sales of foreign reserves and the repatriation of domestic capital invested abroad, given its well-developed and relatively large domestic capital market. Large sales of domestic bonds by foreign investors were absorbed with minimal impacts on domestic yields. The stabilizing role of reserves and private outflows, coupled with the greater flexibility of the exchange rate and strength of domestic financial institutions, could have allowed Malaysia to weather the global financial crisis, effectively establishing firmly its monetary policy independence during this time. This could well be the reason why no regime switching occurred in Malaysia during the GFC. In the case of Thailand, beginning in the first quarter of 2008, a new Bank of Thailand Act strengthened the transparency and accountability of Thailand's monetary policy process, and at the same time, the bond market of Thailand has expanded and deepened by this time. The Act established a clear and formal framework for monetary policy, where the Monetary Policy Committee was charged with legal responsibility in the realm of both the monetary policy target and exchange rate management policy (Grenville and Ito 2010). This strategy appears to bode well for maintaining stability and monetary independence in the country all throughout the GFC in 2007-2008. These policy developments could well account for the reason why the rate gap did not experience a regime switch in 2008 for Thailand.

Table 4. Results from the Full MS Regression Model of Conditional Mean and TVTP

	Variables	Philippines	Indonesia	Malaysia	Thailand
Number of Observations		**111**	**120**	**124**	**185**
Coefficients in Regression					
Common Regressors (time-invariant)					
JP Morgan's EMBI+ Global Index	δ	-0.21			
z-statistic		-2.06**			
Switching Regressors (time-varying)					
Constant Parameters, Regression					
Constant Term, Regime 1	β_1	3.41	1.08	0.43	0.18
z-statistic		7.19***	5.33***	10.52***	0.15
Constant Term, Regime 2	β_2	1.94	0.78	0.01	0.18
z-statistic		4.03***	2.27**	0.32	5.87***
Coefficient Parameters, Regression					
JP Morgan's EMBI+ Global Index, lagged one period, Regime 1	V11		-0.56		
z-statistic			-10.89***		
JP Morgan's EMBI+ Global Index, lagged one period, Regime 2	V12		-0.04		
z-statistic			-0.32		
Risk Premium = 10-Year Sovereign Rate minus 10-Year US Bond Yield Rate, Regime 1	V21				-0.35
z-statistic					-4.38***
Risk Premium = 10-Year Sovereign Rate minus 10-Year US Bond Yield Rate, Regime 2	V22				-0.05
z-statistic					-1.89*
Autoregressive component, lag 1 for Regime 1	ϕ_1	0.85		1.24	
z-statistic		10.04***		6.30***	
Autoregressive component, lag 1 for Regime 2	ϕ_2	0.89		0.43	
z-statistic		12.64***		5.28***	
Coefficients in Transition Probabilities					
Risk Premium = 10-Year Sovereign Rate minus 10-Year US Bond Yield Rate,	α11	-2.70	0.42		
z-statistic		-1.69*	0.98		
Risk Premium = 10-Year Sovereign Rate minus 10-Year US Bond Yield Rate	α21	-4.26	-1.19		
z-statistic		-2.15**	-2.39**		
Foreign Holdings of Local Government Assets as % of Total	α12	0.77	0.08		
z-statistic		2.31**	2.04**		
Foreign Holdings of Local Government Assets as % of Total	α22	0.61	0.03		
z-statistic		1.68*	0.60		
JP Morgan's EMBI+ Global Index, staying probability in Regime 1	α13				0.65
z-statistic					5.33***
JP Morgan's EMBI+ Global Index, switching probability from Regime 2 to 1	α23				-0.94
z-statistic					-9.13***
Foreign Holdings of Tbills	α14			12.84	
z-statistic				1.6*	
Foreign Holdings of Tbills	α24			14.66	
z-statistic				2.9**	
US 10-Year Bond Yield Rate	α15				0.24
z-statistic					1.67*
US 10-Year Bond Yield Rate	α25				-0.23
z-statistic					-9.44***
HSBC's RORO Index	α16			-11.98	
z-statistic				-1.59*	
HSBC's RORO Index	α26			-15.38	
z-statistic				-4.45***	

[b] For Thailand, including AR(1) it in the full model, whether as a common regressor or as switching regressor makes the parameters either NAs or insignificant.

For Indonesia, AR(1) was estimated in another model, separate from the basic because it made regime switching probabilities unclear when included.

We proceed to the discussion of the estimation outputs from the full MS Regress models with TVTP for the four economies, tabulated in Table 4. Under this full model specification, we consider AR(1) coefficients and time-varying transition probabilities as in Filardo (1994,1998), and test which of the global factor or financial market characteristics are significant in the models either as regressors of the switching rate gap or as determinants of the transition probabilities. For the full TVTP specification, the AR(1) coefficient enters the model significantly as a switching regressor for Malaysia and the Philippines. This is indicative of the autoregressive component of the rate gap stemming from policy interest-rate smoothing by these central banks, or the stickiness in the market interest rates, or perhaps from both.

The EMBI+ Global Index emerged as a significant common regressor for the Philippines and a switching regressor for Indonesia. For the Philippines, the coefficient of EMBI+ Global is negative, which means that when the index increases, the rate gap falls regardless of what regime the economy is in. This is consistent with our expectation that higher risk perception acts as a "natural wall" discouraging the inflow of non-resident funds, allowing for the market interest rate to rise and converge towards the level of the policy rate, and the rate gap falls, and the converse is true as well. For Indonesia, the coefficient of EMBI+ Global is more negative during regime 1, the higher rate gap regime, which again lends support to our hypothesis that the higher the indicator of risk perception, the lower the rate gap. Additionally, the coefficient of EMBI+ Global is a lower negative number, but is nonetheless insignificant, under regime 2 for Indonesia.

The EMBI+ Global is also a significant driver of transition probabilities in Thailand. The coefficient sign of EMBI+ Global as a driver of its transition probabilities is negative, which is as expected for both P_{11} and P_{21}. The higher the risk premium, the lower the probability of staying in regime 1, the high rate gap regime, and the lower the probability of switching to regime 1 when it is already in regime 2. What we had expected based on our earlier discussions for all four emerging ASEAN-4 economies is that higher risk perception in emerging economies would mean that foreign investors would be on a risk-OFF mode, and would tend move funds away from emerging Asia, drive up domestic market interest rates, and therefore cause the rate gap to move into, or stay in, the low rate gap regime, regime 2.

The country risk premium indicator is a statistically significant determinant of the transition probabilities P_{11} and P_{21} for the Philippines. This variable enters the model with a negative coefficient as expected, with an absolute value higher for P_{21} and lower for P_{11}. This would mean that the higher the risk premium, the lower the transition probability in both cases, but the magnitude of its impact is higher for the probability of switching to regime 1 when it is already in regime 2, than for staying in regime 1 when it is already in regime 1. For Indonesia, the risk premium indicator is a significant determinant for P_{21} as well. The coefficient of the risk premium indicator for the transition probability of switching from regime 2 to regime 1 has a negative sign, just as we expected. The coefficient of the same variable for P_{11}, however, is insignificant and positive, which would mean that for Indonesia, the probability of staying in regime 1 when it is already in regime 1 increases with higher risk premium levels.

The share of foreign ownership of local currency debt is also a significant determinant of the transition probabilities for the Philippines and Indonesia, with the expected signs in the coefficient values. It is significant and positive for both the switching (P_{21}) and staying (P_{11}) transition probabilities in the Philippines, and although it is also of the expected sign and significant as a driver for P_{11} in Indonesia, it is of the expected sign but insignificant for P_{21}. This outcome means that the higher the share of foreign ownership of local currency debt for the Philippines and Indonesia, the higher the probability of staying or switching into regime 1, the high rate gap regime. This is a result we are expecting based on the hypothesis we have set out in the beginning, that higher non-resident funds' buying into domestic bonds drives down the benchmark interest rate, widening the rate gap.

Foreign investments in Tbills are a significant determinant for Malaysia's rate gap, and the signs are as expected. The coefficient is in fact high at 12.84 for the staying probability, and at 14.66 for the switching probability, which means the higher the foreign ownership of Tbills in Malaysia, the higher the probability of the rate gap staying in regime 1, and the higher the switching probability to regime 1 when it is already in regime 2. Meanwhile, HSBC's Risk-On, Risk Off (RORO) Index entered as a significant driver of both the staying and switching probability to regime 1 in Malaysia, and with the expected negative sign. This could be interpreted to mean that the higher the RORO Index— an indicator that increases when the risk on behavior is prevailing among global investors and decreases otherwise—the lower the probability of staying in the high rate gap regime, and switching into a high rate gap regime when it is already in the low rate gap regime.

For Thailand, the US 10-Year Bond Yield rate is a significant determinant of its transition probabilities, but with coefficients at different signs. Its coefficient is negative, as expected, for the switching probability P_{21}, which means that the higher the US 10-year bond rate, the lower the probability of the rate gap moving into regime 1 or the high rate gap regime. However, it is positive for the staying probability, which is not what we expected. Nonetheless, Thailand's monetary policy and domestic financial markets appears to have a relatively stronger linkage with global financial markets and particularly with US monetary policy, possibly reflecting its managed float exchange rate regime as well as its highly developed and flexible bond markets. Within the ASEAN, it is perhaps acting in the same way as a financial hub over the period being investigated.

From these empirical results, we observe that the ASEAN-4 does not comprise a homogenous set. Looking more closely into the different results, there is what seems to be two sub groupings within the ASEAN-4 economies: Philippines and Indonesia showing more frequent and more prominent switches and longer duration

of staying in regime 1, the high rate gap regime on one end, and Malaysia and Thailand depicting less and a longer duration for staying in regime 2, the low rate gap regime. For the Philippines, the average rate gap is the highest under both regime 1 and regime 2, so that within the definition used in this paper, its policy rate has the weakest influence over market interest rates among the ASEAN-4. Regime-switching in the rate gap of the Philippines is also the most frequent and prominent in the region. This outcome could possibly be traced to factors beyond global attractiveness indicators and financial market sensitivity variables. As seen by Affandi and Peiris (2012), the limited amount of government securities held by the BSP for repo operations and the inability of the BSP by law to issue its own securities could be the structural factors that are keeping Philippine Tbill rates at even more depressed levels even when compared to Indonesia. A second plausible factor is the Philippine National Government's significant foreign borrowing abroad, resulting in numerous rejections in the issuance of domestic Tbills which is limiting the supply of this asset market even further. Given the already thin volumes of government securities available in the Philippine domestic financial markets, a more limited issuance means that when large non-resident funds access the market, interest rates are brought down even further. A deeper examination of these structural issues could be a potential topic for future research.

For factors common to the Philippines and Indonesia, we can point out two most plausible reasons that account for these economies' relatively more pronounced, more frequent recurrence of alternating divergence and then convergence in the rate gap, and a longer duration for the high rate gap regime. One, relates to the *attractiveness* of their domestic assets to foreign investors arising not only because of factors common to EMs, but from remarkable improvements in each of their macroeconomic performance, monetary policy credibility, stability in the external accounts and overall sovereign credit worthiness, compared to how it was performing relative to its ASEAN neighbors in the past. These factors have improved significantly for the two economies during the period in review, and perhaps even more so for the Philippines which achieved some sort of a paradigm shift towards low and stable inflation, consistent current account surpluses up to the present, a high level of foreign reserves, a stable currency, and remarkably improved fiscal discipline all resulting in non-resident capital flows flocking into safer Philippine government securities in search of yield.

A second issue emerging from our analysis is that the higher average rate gaps and the more frequent regime-switching in the rate gap could also a product of relatively thinner and underdeveloped financial markets in both the Philippines and Indonesia, making them more *sensitive* to foreign inflows. The supply of government securities is much more limited in these two countries, and to a larger extent is dominated by government compared to Malaysia and Thailand, so that surges and stops in foreign funds buying into these domestic assets affect benchmark interest rates in a much bigger way. Meanwhile, the financial markets of Malaysia and Thailand are deeper and more developed than in the Philippines and Indonesia. This adds to the stability in domestic interest rate movements so that foreign investors buying into domestic assets are not as disruptive to benchmark interest rate levels for the latter set of countries.

The BOT, in particular, carefully plans the types of bonds it issues to fill in the tenor gaps, i.e. by issuing only shorter-term bonds with tenors that do not replicate national government issues—a strong sign of coordination between the national government and the central bank. More recently, the issuance of BOT bonds in 2011 has contributed to an even wider range of securities for Thailand, so that the domestic bond market has increasingly attracted investors of all types–both locals and non-residents alike. Monetary authorities of Thailand believe that the allocation of absorption instruments needs to be designed such that it takes both the effectiveness of monetary policy transmission and financial market developments into account (Bank of Thailand, 2013). Meanwhile, the BNM and other regulatory agencies in Malaysia undertook large-scale efforts to develop a ringgit bond market resulting in its bond market emerging as one of the biggest and most advanced in the region (Sharifuddin and Ling 2014). During the GFC, for example, the reduction in capital inflows to Malaysia were largely offset by sales of foreign reserves and the repatriation of domestic capital invested abroad. Large sales of domestic bonds by foreign investors were therefore absorbed with minimal impact on domestic yields.

Conclusion

We began this study with the hypothesis that the gap between the policy rate and the benchmark market interest rate follows a Markov-type regime-switching process for ASEAN economies: Indonesia, Malaysia, the Philippines, and Thailand. In addition, we espoused further that the transitional probabilities of the regime-switching in the rate gap for these economies are time-varying, and that the switching from one regime to the next is driven by either variable common to EMs (what we denoted as *attractiveness* factors), such as global risk perception and global liquidity, or other idiosyncratic factors relating to financial market characteristics of each economy (which we denoted as *sensitivity* factors).

From our empirical exercise, we established that the rate gap of the Philippines, Indonesia, and Malaysia could be depicted as a 2-regime, Markov-type regime-switching model of conditional mean and time-varying transition probabilities using the model specification from Filardo (1994, 1998). The result for Thailand is not as robust, however, in that it is only showing one regime switch that occurred in 2001. Unlike in the other three economies, the rate gap of Thailand does not seem to strongly depict a Markov-type regime-switching process whereby there is a recurrence of divergence and convergence over the period being reviewed. Nonetheless, the AIC criterion and the MS Regress results confer that the rate gap of Thailand behaves as a Markov-type regime-switching process, and with two variables emerging as significant determinants of its time-varying transition probabilities.

We have also established in this study that indeed, there are country-specific *sensitivity* factors, as well as external or global *attractiveness* factors which influence the evolution and regime-switching in the degree of influence of monetary policy on market interest rates in the ASEAN-4. Among the indicators of financial market characteristics, it is foreign ownership of local currency debt securities—either as a share to total, or in terms of the levels—that emerged as drivers of the transition probabilities in the rate gap of the ASEAN-4 particularly so for the Philippines, Indonesia and Malaysia. Among the attractiveness factors, changes in global risk perception, such as the country risk premium variable and HSBC's RORO Index, have emerged either as a common regressor of the switching rate gap, or as a determinant of the transition probabilities for the ASEAN-4. For Thailand, US 10-year bond rates turned up as a significant driver of its regime-switching transition probabilities.

These determinants are variables that could be helpful if followed closely by monetary policymakers and perhaps be used as early warning system or leading indicators. They could signal the probability and the number of periods of either staying in or entering a high rate gap period or staying in or switching into a low rate gap period, and hence incorporating the changing relationships between the rate gap and global factors as well as financial market indicators within these two distinct regimes. If incorporated into a macroeconomic forecasting model, for example, the central bank could take into account and anticipate, based on expectations on the global risk premier and foreign ownership variables which were found to be significant drivers of the switching probabilities, those periods when the policy rate has an expectedly weaker influence over market interest rates versus when it has a stronger influence on market rates as additional information in the setting of the appropriate monetary policy stance. The high rate gap and low rate gap periods, and the variables identified for each country as determinants of the switches, could also be used in an interest rate forecasting model which could, if so desired, establish the preferred gap between the policy rate and the relevant market rate over the policy horizon by the monetary authorities in the ASEAN-4.

References

[1] Affandi, Y. and Peiris, S. 2012. Philippines: Selected Issues, *IMF Country Report No*. 12/50, International Monetary Fund (IMF), 12-20. Available at: https://www.imf.org/external/pubs/ft/scr/2012/cr1250.pdf

[2] Ahmed, S., Coulibaly, B., and Zlate, A. 2015. International Financial Spillovers to Emerging Market Economies: How Important Are Economic Fundamentals? International Finance Discussion Paper No. 1135, Federal Reserve Board. Available at: http://dx.doi.org/10.17016/IFDP.2015.1135

[3] Aizenman, J., and Ito, H. 2014. Living with the Trilemma Constraint: Relative Trilemma Policy Divergence, Crises, and Output Losses for Developing Countries. *Journal of International Money and Finance*, 49(Part A): 28-51. Available at: http://dx.doi.org/10.1016/j.jimonfin.2014.05.005

[4] Aizenman, J., Chinn, M., and Ito, H. 2013. The 'Impossible Trinity' Hypothesis in an Era of Global Imbalances: Measurement and Testing. *Review of International Economics*, 21(3): 447–458. Available at: http://dx.doi.org/10.1111/roie.12047

[5] Bank of Thailand 2013. Foreign exchange policy and intervention under inflation targeting in Thailand. *Bank for International Settlements (BIS) Papers No. 73. Market volatility and foreign exchange intervention in EMEs: what has changed?* October 2013, 325-333. Available at: http://www.bis.org/publ/bppdf/bispap73y.pdf

[6] Brenner, R., Harjes, R., and Kroner, K. 1996. Another Look at Models of the Short-Term Interest Rate. *Journal of Financial and Quantitative Analysis*, 31(1): 85-107. Available at: http://dx.doi.org/10.2307/2331388

[7] Cerutti, E., Claessens, S., and Puy, D. 2015. Push Factors and Capital Flows to Emerging Markets: Why Knowing Your Lender Matters More Than Fundamentals. IMF Working Paper No. WP/15/127, International Monetary Fund. Available at: https://www.imf.org/external/pubs/ft/wp/2015/wp15127.pdf

[8] Filardo, A. 1994. Business-Cycle Phases and Their Transitional Dynamics. *Journal of Business & Economic Statistics*, 12(3): 299-308. Available at: http://dx.doi.org/10.1080/07350015.1994.10524545

[9] Filardo, A. 1998. Choosing Information Variables for Transition Probabilities in a Time-Varying Transition Probability Markov Switching Model. Working Paper No. 98-09, Federal Reserve Bank of Kansas City.

[10] Forbes, K., and Warnock, F. 2012. Capital Flow Waves: Surges, Stops, Flight, and Retrenchment. *Journal of International Economics,* 88(2): 235-251. Available at: http://dx.doi.org/10.3386/w17351

[11] Ghosh, A., Qureshi, M., Kim, J., and Zalduendo, J. 2014. Surges. *Journal of International Economics*, 92(2): 266-285. Available at: http://dx.doi.org/doi:10.1016/j.jinteco.2013.12.007

[12] Goldfeld, S., and Quandt, R. 1973. A Markov Model for Switching Regressions. *Journal of Econometrics*, 1(1): 3-15. Available at: http://www.sciencedirect.com/science/article/pii/0304-4076(73)90002-X

[13] Gray, S. 1996. Modeling the Conditional Distribution of Interest Rates as a Regime-Switching Process. *Journal of Financial Economics*, 42: 27-62. Available at: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.335.3427&rep=rep1&type=pdf

[14] Grenville, S. 2011. The Impossible Trinity and Capital Flows in East Asia. ADBI Working Paper No. 319, Asian Development Bank Institute (ADBI). Available at: http://www.adb.org/sites/default/files/publication/156174/adbi-wp319.pdf

[15] Grenville, S., and Ito, T. 2010. An Independent Evaluation of the Bank of Thailand's Monetary Policy under the Inflation Targeting Framework, 2000-2010. Bank of Thailand. 2010. Available at: https://www.bot.or.th/Thai/MonetaryPolicy/Documents/GrenvilleItoV10(Oct22).pdf

[16] Hamilton, J. 1988. Rational-Expectations Econometric Analysis of Changes in Regime: An Investigation of the Term Structure of Interest Rates. *Journal of Economic Dynamics and Control*, 12: 385-423. Available at: http://dx.doi.org/10.1016/0165-1889(88)90047-4

[17] Hamilton, J. 1989. A New Approach to the Economic Analysis of Nonstationary Time Series and the Business Cycle. *Econometrica*, 57: 357-384. Available at: http://dx.doi.org/10.2307/1912559

[18] HSBC Global Research 2012. Currency Strategy from *Currency Weekly*, 17 April 2012.

[19] Hsing, Y. 2012. Test of the Impossible Trinity Hypothesis for Five Selected Asian Countries in the Asian and Pacific Regions. *Economics Bulletin*, 32(1): 616-623. Available at: http://www.accessecon.com/Pubs/EB/2012/Volume32/EB-12-V32-I1-P57.pdf

[20] International Monetary Fund (IMF) 2015. Thailand: IMF Article IV Consultation--Staff Report. 07 May 2015. Available at: https://www.imf.org/external/pubs/ft/scr/2015/cr15114.pdf

[21] Ito, H., and Kawai, M. 2014. New Measures of the Trilemma Hypothesis: Implications for Asia. In: Kawai

[22] Kim, C., and Nelson, C. 1999. Has the U.S. Economy Become More Stable? A Bayesian Approach Based on a Markov-Switching Model of the Business Cycle. *Review of Economics and Statistics*, 81(4): 608-616. Available at: http://www.mitpressjournals.org/doi/pdf/10.1162/003465399558472

[23] Lamberte, M.B., and Morgan, P.J. (eds), Reform of the International Monetary System: An Asian Perspective, pages 73-104, Springer.

[24] Milesi-Ferretti, G., and Tille, C. 2011. The Great Retrenchment: International Capital Flows during the Global Financial Crisis. *Economic Policy*, 26" 285-342. Available at: http://www.hkimr.org/uploads/publication/42/ub_ful ... o-38_2011-final-.pdf

[25] Mohanty, M. S., and Turner, P. 2008. Monetary Policy Transmission in Emerging Market Economies: What is New? *Bank for International Settlements (BIS) Papers No. 35. Transmission mechanisms for monetary policy in emerging market economies.* January 2008, 1-59. Available at: http://www.bis.org/publ/bppdf/bispap35.pdf

[26] Morgan, P. 2013. Monetary Policy Frameworks in Asia: Experience, Lessons, and Issues. ADBI Working Paper No. 435, Asian Development Bank Institute (ADBI). Available at: http://www.adb.org/sites/default/files/publication/156290/adbi-wp435.pdf

[27] Obstfeld, M., Shambaugh, J. C., and Taylor, A. M. 2005. The Trilemma in History: Tradeoffs among Exchange Rates, Monetary Policies, and Capital Mobility. *Review of Economics and Statistics*, 87: 423-438. Available at: http://www.mitpressjournals.org/doi/pdf/10.1162/0034653054638300

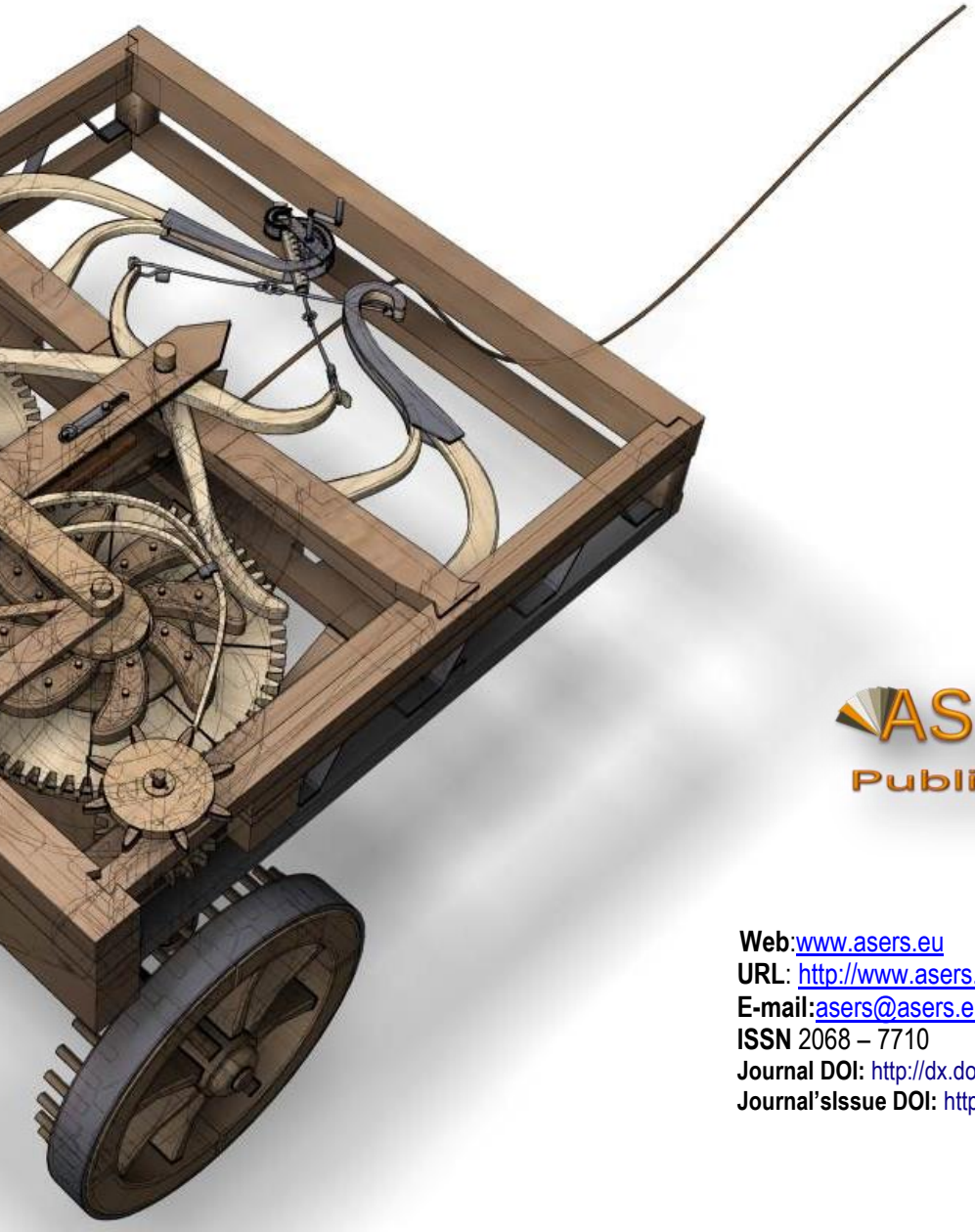
[28] Panigirtzoglou, N., Proudman, J., and Spicer, J. 2000. Persistence and Volatility in Short-term Interest Rates. Bank of England Working Paper No. 116. Available at: http://www.bankofengland.co.uk/archive/Documents/historicpubs/workingpapers/2000/wp116.pdf.

[29] Rey, H. 2015. Dilemma not Trilemma: The Global Financial Cycle and Monetary Policy Independence. NBER Working Paper No. 21162. Available at: http://dx.doi.org/10.3386/w21162

[30] Rummel, O. 2014. Navigating the Open-Economy Policy Trilemma. Presentation at the Centre for Central Banking Studies (CCBS), Bank of England, 26 March 2014. Available at: http://www.pftac.org/filemanager/files/Macro/CCBS/trilemma.pdf.

[31] Sharifuddin, S., and Ling L. 2014. Flattening Yield Curve Amidst Rapid Inflows: The Malaysian Experience. *The Evolving Role and Limits of Monetary Policy: New Perspectives for Emerging Market Economies*, 28-29 October 2014. Manila, Philippines. Available at: http://www.bsp.gov.ph/events/2014/irc/downloads/papers/2014_ERLMP_04_paper.pdf.

ASERS



ASERS Publishing

Web:www.asers.eu
URL: http://www.asers.eu/asers-publishing
E-mail:asers@asers.eu asers2010@yahoo.co.uk
ISSN 2068 – 7710
Journal DOI: http://dx.doi.org/10.14505/tpref
Journal'sIssue DOI: http://dx.doi.org/10.14505/tpref.v7.1(13).00