



**The Effects of Foreign Participation in ASEAN-4
Domestic Sovereign Bond Yields in the Context
of Capital Market Integration**

Thesis
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ERASMUS UNIVERSITY

ERASMUS SCHOOL OF ECONOMICS

MASTER THESIS

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Abstract

This thesis examines the impact of the change in the foreign participation in local currency government bonds on determining the 10 year domestic government bond yields in Thailand, Malaysia, Indonesia and the Philippines, four members of the Association of South East Asian Nations (ASEAN-4) during 2004 Q2 to 2012 Q4. It also examines the level of bond market integration in ASEAN-4 with Singapore as its benchmark. The β -convergence and σ -convergence concept were applied, and both indicated convergence before and after the Global Financial Crisis. However, comparing ASEAN-4 and Asian Emerging Markets (ASEAN-4, South Korea, Pakistan, India), the β -convergence was not statistically different, but its speed of convergence was higher; 0.23 for ASEAN-4 and 0.18 for the Asian Emerging Markets. In addition, the main results of the fixed effects model conveyed that greater change in foreign participation in the domestic government bond market significantly reduced long-term government bond yields by 5-7 basis points for every 1 percent increase in the change of foreign participation. However, a tentative Granger Causality test was not significant at the country level between sovereign bond yields and the change in the foreign participation. Meanwhile the ASEAN-4 sovereign bond market converged, the foreign participation in the sovereign bond market increased, specially after the crisis which concurs with σ -convergence.

JEL Classification Numbers: E44, G1, G12, G15, H63, O19

Keywords: Government Bond Yields, Foreign Investment, Integration, Investor Base, Emerging Market Economies, Financial Crisis

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1 Introduction

It has been a decade since ASEAN has launched a major effort to develop its domestic bond markets. In the context of the Association of South East Asian Nations (ASEAN) economic integration by 2015, the sovereign bond yields have experienced a steady decrease since the early 2000's. Felman et al. (2014) argued that ASEAN-5ⁱ bond markets have developed to the point where they have begun to serve as a spare tire in case other parts of the financial system became impaired; and where foreign investors are now eager to expand their investments, particularly in local currency fixed income assets.

The Global Financial Crisis (GFC) and the European Debt Crisis have destabilized the once certain sovereign bond markets in the advanced economies. Emerging countries sovereign bond yields are usually higher than advanced economies because of the future economic uncertainties such as inflation, currency depreciation, debt levels and fiscal imbalances. Nevertheless, the situation has changed in ASEAN-4ⁱⁱ. Their sovereign bond yields have experienced a steady decline since early 2000, and even after the GFC. After the Asian Crisis in 1997, the domestic sovereign and corporate local currency bonds have risen in order to counter the double mismatch of currency exchange and long-term financing that firms and countries encountered. Balakrishnan et al. (2013) revealed that net capital inflows to emerging Asia rebounded at a record pace following the GFC, primarily to ASEAN-5 which received the highest inflows.

Peiris (2013) had found, in 10 emerging countries, that foreign participation decreased local currency government bond yields. However, the time period is before the GFC, and the paper did not focus on ASEAN-4, but only takes into account Thailand and Malaysia. In the *context of ASEAN capital market integration*, and the surge in capital inflows within ASEAN-4 during and after the GFC, this thesis attempts to investigate the effects of foreign participation in domestic sovereign bond yields.

The purpose of this paper extends from Arslanalp & Poghosyan (2014), which is to analyze the factors driving the domestic sovereign bond yields among the ASEAN-4 from the perspective of foreign investor decisions. While this paper acknowledges the importance of fundamental macroeconomic, monetary, and fiscal policy determinants for explaining the dynamics of long-term sovereign bond yields in ASEAN-4, the analysis would mainly focus on the impact of the foreign participation on the domestic sovereign bond yields.

Hypothesis Foreign participation decreased domestic issued sovereign bond yields in ASEAN-4 in the *context of capital market integration* during and after the Global Financial Crisis.

Foreign participation is the foreign share of domestic government debt, and the ASEAN capital market integration will solely focus on the integration of sovereign bond yields.

ⁱASEAN-4 + Singapore

ⁱⁱThailand, Malaysia, Indonesia and the Philippines

The period of study is from beginning of 2004 to the end of 2012, including the GFC, which started when the Lehman Brothers filed for bankruptcy protection in September 2008. This thesis is structured as follows, section II discusses the past literature and the recent developments of ASEAN. Section III provides information about the data used. In section IV, the methodology is described: σ and β convergence for assessing bond market integration, and the fixed effects model for assessing the foreign participation as a determinant of domestic sovereign bond yields. Section V discusses the analysis, the results and the robustness checks. Finally, section VI finishes with a summary, conclusions and suggestions for further research.

2 Literature Review

The literature review is organized in three parts. First, the usual drivers that have been assessed in the literature. Second the ASEAN integration and its bond market and third, the literature regarding the foreign participation as a potential driver of sovereign bond yield.

2.1 Sovereign bond yield determinants

Studies related to sovereign bond yields are mainly studied on the European Union (EU) because of the peculiar market conditions that resulted from their economic unification, namely common currency and monetary policy. There is no currency risk, and each EU member state has forfeited its monetary independence to a supranational entity: the European Central Bank. Before the EU market integration, their sovereign bond yields were dissimilar, however, the yields were converging even though fiscal and fundamental factors were different between future EU member states. The market penalized the fiscal balances and debt to Gross Domestic Product (GDP) before the European Monetary Union.

The main problem that arise from studying the sovereign bond yields is due to the lack of data, as fundamental data are released usually once per year, and extrapolation to smaller frequency tend to be common. Economists tend to use econometric methods that enable them to pool data from various countries that share similarities, common institutions with higher integrated markets. By pooling data, there is higher data availability that allows the regression results to be statistically consistent. The larger the sample size, the larger the chance to find a significant difference. The random and fixed effects models have been the popular models used in order to understand the drivers of the sovereign bond yields as well as the risk factors of the sovereign bond yield spreads. The yield spreads between the US sovereign bond yield acting as a risk-free interest rate and other sovereign bond yields are important indicators of financial fragility for country scrutiny. They are commonly used to measure the market perception of a country's risk profile, which might default, they are used as well to assess external financing conditions (Ferrucci, 2003).

The significance of the drivers of sovereign bond yields vary across time periods due to events that shape global and regional economic development, and investor risk perception. Local economies are highly influenced by external economic players, and globalization has increased interdependence. Financial bond markets have been, for a long time and still are, regarded as safe assets, at least safer than relatively more volatile assets such as stocks. The economic uncertainty that prevails during times of crisis deregulates relationships between assets. The GFC in 2008 has fragilized the banking system. The European Debt Crisis in 2009 destabilized the world economy, further increasing the mistrust relative to safer assets.

Jaramillo & Weber (2013) observed that fiscal variables were not significant for domestic

bond yields in emerging economies during relatively tranquil times in global markets. However, in periods of relatively higher financial turmoil, the global risk aversion which is proxied by the Chicago Board Of Equity Volatility Index (VIX) rises, and evidence showed that a positive relationship built up during the global financial crisis of 2008 for advanced and emerging countries.

Empirical studies suggested that emerging and advanced economies shared similar fundamental drivers for sovereign bond yields, but political and governance factors play a bigger role in emerging economies (Eichler, 2014). Market prices are likely to follow expectations about the evolution of fundamentals more than past realised values. The expected real Gross Domestic Product (GDP) growth rate, the expected current account and the expected inflation rate are macroeconomic factors that influence the sovereign bond yields in theory. Peiris (2013) has found, in a panel of ten emerging countries including Thailand and Malaysia during 2000 to 2009, that inflation and the current account impacted the sovereign bond yields. An increase of 1 percent of inflation and current account raised the sovereign bond yields by 16 and 13 basis points, respectively. D'Agostino & Ehrmann (2012) worked with a set of expectations of market participants from Consensus Economics and have found that the G7 sovereign bond yields are influenced by inflation and the current account to GDP, but in different proportions and signs. The expectation of the GDP growth for both case scenarios was not relevant statistically.

The currency risk is another major factor for international investors as the financial bond markets become more integrated. Given that the focus of this thesis is the foreign investor participation in the sovereign bond yields in four distinct countries with their own central banks, the exchange rate risk is relevant. Peiris (2013) used the current account as a proxy of currency risk. However, Caceres & Unsal (2013) used the first principal component (PC1) of three variables, namely the volatility, appreciation of the exchange rate against the US currency and the change in the foreign reserve. Currency risk seemed to be an important factor in explaining the behavior of sovereign spreads in Asia during the crisis period. Indeed, the authors discovered that the deterioration of the exchange rate risk index (ERRI) leads to a tightening of the swap spreads in most Asian countries.

Du & Schreger (2013) analyzed a panel of ten emerging countries over 2005 to 2011, and showed that local currency sovereign spreads are much smaller than the corresponding foreign currency spreads. In addition, the authors has illustrated that local currency spreads are less correlated across countries than foreign currency spreads. As foreign currency spreads are more correlated with global risk factors than local currency spreads.

Gupta et al. (2008) identified that better political prospects lowered the spread, but with political instability it raised sovereign spreads as investors required an extra premium for political instability. The authors employed as the political risk factor the PC1 of a principal component analysis (PCA) of a set of political variables. Eichler (2014)

analyzed the political determinants of sovereign bond yields spreads for 27 emerging markets, including ASEAN-4, from 1996 to 2009. The novelty about Eichler (2014) paper is the wealth of political variables that have been utilized, and that all variables have been tested among common political traits, altogether. The four main political traits are the political system, including elections and ideologies that gather a multitude of variables, then political stability, the feasibility of policy change and the quality of governance. The economical interpretation of the paper is rooted from the theory that governments can choose to default on their debt. In emerging markets, the financial structure and checks and balances of the political structures are not fully democratic and periods of political instability have an impact on the countries' economic growth. The innovative aspect of the drivers of the sovereign bond yields comes with a cost: the frequency is yearly. The authors resorted to a yearly average of the daily sovereign spread as a robust check on the fixed effect regressions.

Most of the governance indicators influence the yields. The overall political stability index, parliamentary system, assembly elected president, left or right party government, rule of law, regulatory quality, government effectiveness, and voice and accountability are significant variables.

2.2 ASEAN integration & bond market development

According to Aldaba & Yap (2009), one of the intentions of the evolving ASEAN Economic Community (AEC) is to enhance free investment flows and freer capital flows. This was carried out as part of the AEC blueprint during the ASEAN Economic Ministers Meeting held in 2006 and prescribed in January 2007. The free entry into financial service industry and the lowering of barriers to capital flow are the crucial elements to regional and global financial integration, however, the AEC is concerned mainly with regional financial integration. The AEC blueprint enables faster implementation to regional capital integration, by facilitating and liberalizing investment, and in return higher capital flows is expected.

As Pradhan et al. (2011) noted, before the Asian Financial Crisis that occurred in 1997, the financial system was extremely bank-centric, with little alternative channels of intermediation. They pointed out that the government and firms borrowing underwent a double mismatch that ultimately hurt the economy during the 1997 crisis. The fact was that the domestically oriented investment projects were being financed through short-term and non-local currency borrowing. Countries in the region were perceived to be excessively dependent on volatile capital inflows, even though there was an abundance of domestic saving.

Rahul Anand (2014) made an analysis on the growth trends in the EMs, including the ASEAN-4. The ASEAN-4 all have had rising growth after the GFC, but Indonesia has registered the strongest rising trend growth, but Malaysia and Thailand have undergone a further slowdown following the GFC. The main conclusion is that there is a high

potential growth in ASEAN. The author attributed the solid growth to domestic demand, intra-regional integration, improved governance and structural reforms. The net capital flows to emerging Asia has picked up at a record pace following the GFC (Balakrishnan et al., 2013).

Since the late 1990s Emerging countries domestic bond markets have grown rapidly as a instinctive outcome of the financial crises. It also branches from the motivation of governments, banks, and corporates to be more resilient to financial crisis. They used domestic sources of finance from external sources of finance to insulate themselves against the changing nature of international capital (Ramaswamy et al., 2004). Capital inflow to ASEAN has increased after the GFC and the European Debt Crisis more than the other EMs on average, it has been pointed out in the works of Balakrishnan et al. (2013). It has a higher potential growth with Indonesia leading the ASEAN members. Its trend growth during 2011-2012 has surpassed the average rates recorded prior to both the 2008 GFC and the late 1990 Asian Crisis (Rahul Anand, 2014).

By developing the domestic bond markets, three problems could be solved. As Pradhan et al. (2011) indicated, a dynamic domestic bond market would establish another financing channel as a substitute or alternative in case banks, would again encounter adversities. The fact that the bond market could be in local currency and providing long-term financing, would eliminate the financing double mismatch that firms encountered during and after the crisis. Firms would not be restricted by their dependence on foreign capital markets, therefore, in ASEAN a considerable effort over the past decade has been underway to develop its bond markets.

2.3 Foreign participation

Arslanalp & Tsuda (2014) proposed an approach of tracking US\$ 1 trillion of EMs government debt held by foreign lenders in both local and foreign currency. Over the last decade, EMs have made significant improvements in public debt management, lowering the supply side risks which is the risk associated with how debt is issued. By improving their balance sheet, their economy has become more resilient to shocks.

According to Pradhan et al. (2011), much of the demand for bonds came from outside the ASEAN region, and they are concerned whether the foreign purchases during the GFC reflect a momentary phenomenon or a true shift in foreign investor behavior.

Foreign investors can be an important source of demand for local EMs debt securities and thus help lower bond yields as the results shown in Peiris (2013) work. A panel data analysis of 10 emerging countries including Thailand and Indonesia from 2000-2009 has demonstrated that foreign participation significantly reduced the government bond yields. Foreign participation did not necessarily lead to greater bond yield volatility in emerging countries. The study used a few variables and mentioned that the results were to be read with caution, since other relevant variables, if added, could change

the significance of foreign participation. The paper suggests that domestic institutional investors are generally buy-and-hold investors, while non-domestic investors are more likely to trade more frequently and contribute to a higher liquid market. Selected case studies in emerging and mature government bond markets provide qualitative evidence that foreign participation increased market liquidity hence lowering the yields (?).

Following the similar idea, Arslanalp & Poghosyan (2014) analyzed advanced economies sovereign bond yields, and determined that foreign investors play a supportive role in driving down the sovereign bond yields. The foreign participation has been split in different categories. A greater diversity of preferences and views coming from different types of foreign and non-foreign investors will lead to more trading, greater price discovery and more liquid and efficient markets. Arslanalp & Poghosyan (2014) found that the foreign investor flows positively influenced the sovereign bond yields for certain advanced economies from 2004 to 2012. One percentage point increase in the share of government debt held by foreign investors can explain a 6-10 basis point reduction in long term sovereign bond yields. However, to major advanced economies bond markets after the GFC the government bond yields have reduced from 35-65 basis points in Germany, 20-30 basis points in the UK, and 35-60 basis points in the US. Furthermore the study noted that the flight to safety is present to a few emerging countries.

Econometric results from Andritzky (2012) distinguished a connexion between the investor base and bond pricing in the G20 advanced economies and the euro area. An gain in share of non-resident investors was associated with lower yields. The Granger Causality tests and a panel vector autoregression pointed to lower yields attracting non-resident investors. The statistical relation between non-resident investors and yields seemed to originate from a pull effect in the joint sample, the low stable yields based on sound macroeconomic fundamentals attract foreign buyers. One of the striking trends about the different investors during the crisis in advanced economies was that domestic investors emerged as primary buyers of domestic issuance debt during the crisis while non-resident investors tended to withdraw.

3 Data

There is limited access to all ASEAN member states data on their local currency sovereign bond yields, hence this thesis assessed the most developed members, namely Thailand, Malaysia, Philippines and Indonesiaⁱⁱⁱ. Access to variables for Singapore is available but discarded since it is already developed and does not exhibit fluctuations like the emerging countries in terms of sovereign bond yields. There is no cointegration equation under the Johansen cointegration with the eigenvalues procedures for the long run. Even though the ASEAN members are reaching an economic community in 2015, the bond market is still not yet cointegrated. There is a lack of data for Vietnam thus discarded. The period of interest starts from **2004-Q2** to **2012-Q4**, before and after the global financial crisis. The period is of interest because it extends the period that Peiris (2013) have focused, and the financial market outlook was uncertain.

The determinants detailed in the following subsections are used as the drivers of sovereign bond yields generally acknowledged by academicians (Arslanalp & Poghosyan, 2014; Eichler, 2014; Petrova et al., 2010; Jaramillo & Zhang, 2013; Csonto & Ivaschenko, 2013; Afonso et al., 2012; Marta Gómez-Puig and Simón Sosvilla-Rivero and María del Carmen Ramos-Herrera, 2014; Afonso & Félix, 2014; Aßmann & Hogrefe, 2009; Pham, 2014). The observations are quarterly, those variables that have yearly frequency are either extrapolated linearly or constantly. The political variables are found yearly and extrapolated constantly because investors incorporate political information ahead of time. Constant extrapolation is more adequate as sovereign bond yields change according to the financial market outlook. Political and Governance stability in the long run is important for investors in order to properly price the government bonds. The actual GDP and inflation is found yearly and linearly extrapolated like it is practiced in the literature. However, to capture the forward looking nature of markets, projections of GDP and inflation available at time t is retrieved from each World Economic Outlook (WEO) yearly vintages in April and October/September, and therefore it is *linearly* extrapolated. Table 1 reports the sources as well as a short description of the variables used for the analysis. Tables 2,3,4,5 reports the descriptive statistics for each country under study and Table 6,7 reports the panel descriptive statistics, and their pairwise correlation for this thesis, respectively. Appendix B displays the graphs of the domestic sovereign bond yields and its determinants through the time period under consideration.

3.1 Country Specific Fundamentals

Macroeconomic determinants have proven to be important in determining sovereign bond yields in previous literature. The most relevant are chosen for this thesis.

- Expected Inflation usually drives the sovereign bond yields because investors are interested in real returns. **Expected inflation** ($\mathbf{E}[\pi]$) at time t is used to

ⁱⁱⁱ They are Bloomberg Generic sovereign bond yields in local currency, as for the Philippines it is retrieved from the Philippine Dealing and Exchange Corp

control for the Fisher theory. The forecasted values are released twice a year. The expected inflation is extracted from each semi-annual WEO release, respectively April and September/October each year. The average of the available predicted inflation from time t onwards is used. The WEO forecast vintages are available publicly.

- The Expected **real GDP year on year growth** ($E[GDP.yoy]$) at time t onwards, to control for the country's cyclical position. A percentage increase raises the economic prospects of the country thus its coefficient should be negative. The average predicted values from the gross domestic product current prices in percentage values are used from the WEO semi annual vintages since April 2004.
- The total **locally issued Debt (foreign currency and local currency) to current and expect GDP** ($govdebt.gdp$ & $E[govdebt.gdp]$) is calculated with Arslanalp & Tsuda (2014) debt divided by the current GDP and expected GDP from the WEO. It is then multiplied by 100, for it to be measured in percentage term.

Policy determinants affect the short term yields as well as the long term yields.

- The **Short term bond yield** ($yield2$) is the two year sovereign bond yields which translates the impact of the country's monetary policy stance on long term sovereign bond yields (Arslanalp & Poghosyan, 2014).

3.2 Investor Base

There is only the foreign participation in the domestic government debt. However for local and foreign currency the debt composition is larger.

- The **Share of the Foreign Holding** ($Foreign$)^{iv} of locally issued debt is extracted from the Quarterly External Debt Statistics (QEDS) for Thailand and Indonesia. Foreign participation in the locally issued government debt for Malaysia and the Philippines data are supplemented with national data from Bank Negara Malaysia, as for the Philippines it is inferred from the balance of payment statistics reported by Bangko Sentral ng Pilipinas ("portfolio liabilities of general government"). The database is extracted from the workings of Arslanalp & Tsuda (2014) in the [IMF library](#)
- The following variable is included in the investor base section. The **Domestic Central Bank local and foreign currency debt share** ($CentralBank$) is retrieved from the previous database mentioned. Domestic central bank holdings of government debt are collected from the International Financial Statistics (IFS),

^{iv}The other Foreign Investor based variables notably banks, non-banks, and official foreign holdings are not used because they are holdings of the overall debt including local and foreign currency debt. The dependent variable is the local currency 10 year sovereign bond. At this date, there are no datasets including these investor base for domestic currency government debt solely.

based on the gross claims of monetary authorities and 'other depository corporations' (IFS definition) on the central government and local government. It is expected to decrease sovereign bond yields. However, it is not the Central Bank share of the locally issued debt but the overall central bank debt share.

3.3 The Exchange Rate Risk Index

The **Exchange Rate Risk Index (ERRI)** plays a relevant role for international investors and an increase should raise the sovereign bond yields. The construction of the index follows from the works of Caceres & Unsal (2013). The three measures are then aggregated into an index with their respective weights where the idea follows from the increase volatility in exchange markets is followed by an increase in uncertainty. When the local currency exhibits depreciation, it could raise concerns about the changes in the value of the government debt, specially if a sizeable share of this debt portion is denominated in foreign currency. Furthermore, in a scenario of rapid depreciation, even attempting to maintain a peg, currency risk is still present because the country could run out of foreign reserves. I resorted to the changes in the Special Drawing Rights (SDRs) rather than the foreign reserves used in Caceres & Unsal (2013) method because of a lack of data.

The ERRI includes three measures, one for currency depreciation or appreciation, the exchange rate volatility and also a measure reflecting the changes in the foreign reserves with the SDRs.

- Measure of currency appreciation and depreciation : $\Delta EXR_t = \frac{EXR_t - EXR_{t-T}}{EXR_{t-T}}$ where $T = 3$ months, it is the percentage change of the exchange rate relative to three months.
- Measure of exchange rate volatility: $E\bar{X}R_t = \sum_{t=1}^T \frac{|\ln(EXR_t/EXR_{t-1})|}{T}$ where $T = 3$ months, it is the three month rolling averages of the absolute deviation between the log value of the exchange rate on a given day and the day before
- Measure of changes in the foreign reserves ^v: $\Delta Res = \frac{Res_t - Res_{t-T}}{Res_{t-T}}$ where $T = 3$ months.

Note that EXR_t is the exchange rate against the US dollar at time t . The following steps are taken in order to get the ERRI. At first the z-score transformation for each measure taking into consideration all countries in our sample and across the entire time period. Then a Principal Component Analysis (PCA) is performed in order to extract the eigenvectors which in turn become the weights for each measure previously mentioned. The eigenvectors are 0.671 for an appreciation in the exchange rate, 0.214 for an increase in volatility, and -0.71 for an increase in the SDRs. The PCA consists of searching the linear combination(s) of the variables which can produce the highest possible variance with decreasing contribution to the total variance and lack of correlation between the

^vDue to lack of data for foreign reserves, the Special Drawing Rights from the IMF is selected

principal components. The *first principal component* is used as the Exchange Rate Risk Index since it captures the largest variation in the three measures altogether. According to Caceres & Unsal (2013) an increase in the ERRI is discerned as an increase in the exchange rate associated risk. It could be due to the decline in value relative to the US currency, an escalation in volatility, a fall in foreign reserves, or a mixture of the latter possibilities.

3.4 Global Market Sentiment

- Global Risk is proxied by the **VIX index** (*vix*), which is a computed implied volatility from an average of the options of the S&P 500 stocks. It is a forward looking measure often called the investor fear gauge since it tends to spike during market turmoil periods (Whaley, 2000). The VIX index is a trademarked ticker symbol for the Chicago Board Options Exchange Market Volatility index and is a key measure of market expectations of near term volatility conveyed by the S&P 500 stocks option prices. It is the most traded index in the world, it is a measure of investor's risk appetite and captures the investors sentiment. A rise of the VIX index should increase the sovereign bond yields. To some extent the VIX index specially during crisis periods captures global liquidity conditions.
- Global liquidity conditions with the **US Federal funds rate** (*USfundsRate*) as a proxy. Lower Federal funds rate is assumed to be associated with higher liquidity, which in turn is expected to be summarized with positive spreads (Peiris, 2013).
- A **dummy variable** (*D.crisis*) is added with zeros before the GFC and ones afterwards. The GFC was attributed at the bankruptcy filing of the Lehman Brothers in september 2008. This dummy variable will capture the global market shift that had occurred at that period onwards.

3.5 Political and Governance Indicators

The political and governance risk environment is prevalent for emerging countries, there are empirical evidence that a few political and governance variables affected the sovereign bond yields in the works of Eichler (2014). The data is from the [Worldwide Governance Indicators \(WGI\)](#). The [WGI Aggregation Methodology](#) for the estimates is constructed by averaging together data from the underlying sources to the concept of governance being measured. The WGI draw its [sources](#) from four different types, surveys of households and firms, commercial business information providers, non-governmental organizations and public sector organizations. It is then constructed in three steps, assigning data from individual sources to the respective aggregate indicators, preliminary rescaling of the individual source data to run from 0 to 1 to finally use an *Unobserved Component*

Model to construct a weighted average of the individual indicators for each source^{vi}. For a full description of the indicators please refer to Kaufmann et al. (2010). The political and governance indicators range from approximately -2.5 (weak) to 2.5 (strong) governance performance.

- The overall **Political Stability Index** (*polstab*) is measured with the Worldwide Governance Indicators which measures the risk that the government is destabilized or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism.

In terms of *Quality of Governance*:

- The **Voice and Accountability** (*VoicenA*) indicator captures level of citizen's right to freedom of expression, freedom of association and voting for their government.
- The **Government Effectiveness** (*goveff*) which reflects perceptions of the quality of civil and public services including the degree of independence from political pressure. Furthermore, it captures the credibility of the government's commitment and implementation of their policies.
- The **Regulatory Quality** (*regquality*) captures the effectiveness of policies and regulations that promote private sector growth. It reflects the perceptions of the government's capability to enforce it.
- The **Rule of law** besides capturing the likelihood of crime and violence, it reflects in the framework of the agents confidence in and abide by the rules of contract enforcement. Most particularly in the effectiveness of contract enforcement, property rights, the police and the courts.
- Lastly the **Control of Corruption** (*Corruption*) which is relevant since on average the ASEAN-4 is ranked 90.75 out of 177 countries in [Transparency International](#). It summarizes the abuse of public power for private gains, from petty to grand forms of corruption.

^{vi}The WGI variables are a research dataset summarizing the views on the quality of governance provided by a large number of enterprise, citizen and expert survey respondents in industrial and developing countries. The data are gathered from a number of survey institutes, think tanks, non-governmental organizations, international organizations, and private sector firms. The WGI do not reflect the official views of the World Bank, its Executive Directors, or the countries they represent.

4 Methodology

4.1 Level of Integration

To assess the sovereign bond market integration, the beta and sigma convergence concept will be taken in consideration on top of *the Johansen cointegration that did not provide a statistical equation for the domestic sovereign bond yields*. The concepts of beta and sigma convergence originates from economic growth and its dynamics by Barro & Sala-I-Martin (1991). But Adam et al. (2002) has endorsed the concept of beta-convergence and sigma-convergence to demonstrate the process of financial market integration. The paper focused in the euro area member states. The concept can therefore be adapted to the sovereign bond market in the ASEAN market. The **β -convergence** measures the speed of adjustment of countries' divergence to the long-run benchmark value. The **σ -convergence** measures the countries comovement over time in terms of deviations from the benchmark, in this case, Singapore. Singapore dominates the region because they went through the financial liberalization first. It is the relevant benchmark for this study because of its market advancement and development relative to other markets in the region. Singapore is the most developed of all the ASEAN members.

In order to infer the sovereign bond yields convergence to the benchmark, three other Asian^{vii} sovereign bond yields will be used.

β -convergence This methodology will indicate whether integration is taking place and if it is occurring, to what extent.

$$\begin{aligned} \Delta y_{i,t} = & \alpha_i + \beta_{pre-crisis} y_{i,t-1} + \beta_{ASEAN.4} ASEAN.4 * y_{i,t-1} \\ & + \gamma_{Dcrisis} + \beta_{crisis} DCrisis * y_{i,t-1} \\ & + \sum_{l=1}^L \gamma_l \Delta y_{i,t-l} + \epsilon_{i,t} \end{aligned} \quad (1)$$

where i and t denote the respective country's spread against Singapore (the benchmark) and time indices, Δy is the change in the sovereign bond yields (the difference operator Δ) and α_i the country dummies; where l denotes the lag and L the maximum lag of the dependent variable which is the sovereign bond yield differentials^{viii}. The exogenous shocks, which are the error term on the right hand side of the equation, force the sovereign bond yield differentials between the considered countries. One dummy variable

^{vii}Only available Asian emerging sovereign bond yields were retrieved, namely South Korea, India and Pakistan. Note that they are Bloomberg Generic domestic sovereign bond yields. As for Singapore and the Philippines the sources are the Monetary Authority of Singapore, and Philippine Dealing and Exchange Corp, respectively.

^{viii}The lags of the fixed effects model is to correct for the autocorrelation in the error term, as the error term needs to be Identically Independent Distributed

DCrisis captures the GFC, the other dummy variable *ASEAN.4* captures the ASEAN-4 impact, taking one for countries in ASEAN-4. The lack of stationarity should not be a problem as a result of the first differences of the sovereign bond yields. A negative β signals convergence (if $\beta = 0$ or $\beta = -2$ there is no convergence observed). Furthermore the magnitude of β denotes the speed of convergence. From $\beta = 0$ to $\beta = -1$ it indicates monotonous convergence, while fluctuating convergence occurs for values $\beta = -1$ to $\beta = -2$. β can therefore be interpreted as the convergence speed if taken in its absolute term (Babecký et al., 2008).

σ -convergence The concept of σ -convergence captures the cross sectional differences between the sovereign bond yields at a given time, in fact it is measured as the cross sectional standard deviation. σ -convergence takes place if and when the cross sectional standard deviation falls to zero in theory. A lower σ -convergence measures a higher convergence, the comovements are the same. The quantification of the concept is a cross sectional standard deviation according to the following formula:

$$\sigma_t = \sqrt{\left(\frac{1}{N-1}\right) \sum_{i=1}^N [\log(y_{i,t}) - \log(\hat{y}_t)]^2} \quad (2)$$

Where y is the domestic sovereign bond yields, \hat{y}_t is the mean of the cross section over time t and i stands for countries spread against their benchmark ($i = 1, 2, \dots, N$). For the purpose of this analysis we introduce $N = 4$ for ASEAN-5 and $N = 7$ for the Asian EMs. The lower the volatility, the higher the level of convergence. In theory, full integration is reached when the sigma-convergence coefficient is zero, while higher values of σ reflects a lower degree of integration.

It is important to note that the two convergence indicators do not entail the same information about the level of convergence. β -convergence does not imply σ -convergence and vice versa. The beta convergence does not imply that the cross sectional variance decreases over time, therefore both notions of convergence is proposed to assess the financial bond market integration in the ASEAN-5 and Asian EMs.

4.2 Assessing the change in foreign participation

The methodology follows most methodologies in the literature of sovereign bond yields with some exceptions. Due to the narrow focus of this thesis and the fact that these emerging countries have a higher growth pattern than other emerging countries for after the GFC Balakrishnan et al. (2013), tests for unobserved heterogeneity is performed to retrieve the proper model. The basic linear panel models used in econometrics can be described through suitable restrictions of the following general model:

$$y_{i,t} = \alpha_{i,t} + x'_{i,t}\beta_{i,t} + \mu_{i,t} \quad (3)$$

where $i = 1, \dots, n$ is the individual country index, $t = 1, \dots, T$ is the time index and $\mu_{i,t}$ is a random disturbance term with its expectation equal to zero $E(\mu_{i,t}) = 0$. A number of assumptions are made about the parameters, the error term and the exogeneity of the regressors, giving rise to different feasible models for panel data with different economic meaning. $x_{i,t}$ is a matrix composed of the respective independent variables of each country's variable stacked on top of each other, and $\beta_{i,t}$ is the coefficient of the regressors. However, for this study the parameter $\beta_{i,t}$ does not have time effects nor individual effects because of the lack of data.

The regressors for each country i are the fundamental risk variables, global risk variables, political and governance risk variables and foreign investor variable $x_{i,t}$.

This thesis will follow the eclectic approach used in many papers in which the assumptions about the unobserved effects differ (Marta Gómez-Puig and Simón Sosvilla-Rivero and María del Carmen Ramos-Herrera, 2014; Afonso et al., 2012; Afonso & Félix, 2014; Arslanalp & Poghosyan, 2014; Eichler, 2014).

4.2.1 Fixed Effects Panel Regression

To model individual heterogeneity, a fixed effect panel regression is predicated with the following equation:

$$y_{i,t} = x'_{i,t}\beta + \mu_i + \epsilon_{i,t} \quad (4)$$

where $i = 1, \dots, N$ and $t = 1, \dots, T$, where $x_{i,t}$ is a $(k-1) * 1$ vector of explanatory variables that excludes a constant term, and μ_i are country specific effects. μ_i is part of the error component. β_i is the coefficient of the regressors. However, the idiosyncratic errors are independent and identically distributed which means $\epsilon_{i,t} \sim IID(0, \sigma_\epsilon^2)$. The assumptions of the model are the following about the unobserved component μ_i and $\epsilon_{i,t}$:

- μ_i is freely correlated with the independent variables $x_{i,t}$
- $E(x_{i,t}\epsilon_{i,s}) = 0$ for $s = 1, \dots, T$ and $t = 1, \dots, T$ which translates to no correlation between the error term and the independent variables, hence strict exogeneity.

In other words, the fixed effect model accounts for differences between countries, μ_i is allowed to vary among countries capturing the country heterogeneity (the unobserved effect). It can be interpreted as each country's intercept and it captures institutional characteristics, in this case the domestic financial market. The fixed effects panel regression in practice is usually referred as the Least Square Dummy Variable (LSDV) because it is how the analysis is implemented, each set of country observation gets a dummy variable in an Ordinary Least Square which captures the country effect.

Collecting the $y_{i,t} = x'_{i,t}\beta + \mu_i + \epsilon_{i,t}$ in matrix notation gives:

$$\begin{bmatrix} y_{1,t} \\ y_{2,t} \\ y_{3,t} \\ y_{4,t} \end{bmatrix} = \begin{bmatrix} x_{Thailand,t} \\ x_{Malaysia,t} \\ x_{Indonesia,t} \\ x_{Philippines,t} \end{bmatrix} \times \beta + \begin{bmatrix} \iota_t & 0 & 0 & 0 \\ 0 & \iota_t & 0 & 0 \\ 0 & 0 & \iota_t & 0 \\ 0 & 0 & 0 & \iota_t \end{bmatrix} \times \begin{bmatrix} \mu_1 \\ \mu_2 \\ \mu_3 \\ \mu_4 \end{bmatrix} + \begin{bmatrix} \epsilon_{1,t} \\ \epsilon_{2,t} \\ \epsilon_{3,t} \\ \epsilon_{4,t} \end{bmatrix}$$

or $y_{i,t} = [x_{i,t} \ d_1 \ d_2 \ d_3 \ d_4] \times \begin{bmatrix} \beta \\ \mu_i \end{bmatrix} + \epsilon_{i,t}$ where d_i is a dummy variable indicating the i_{th} unit. Let the NT*N matrix $D = [d_1 \ d_2 \ d_3 \ d_4]$. Then, assembling all NT rows gives

$$y = X\beta + D\mu + \epsilon \quad (5)$$

The constant term differentiates unobserved aspects of each country from each other, however the coefficients β are not allowed to vary across countries. The ι_t is a $T \times 1$ vector. The model has $(N + K)$ parameters: N for μ_i and $(K - 1)$ for β and 1 for the variance of the error term σ_ϵ^2 .

5 Results & Discussion

5.1 Integration Results & Discussion

The ASEAN-4 under this thesis are emerging countries that are expected to establish economic integration by 2015. Integration of capital markets in the ASEAN context does not refer to a common currency market such as in the European Union, but as Singh (2009) noted, 'à process of creating enabling conditions for cross-border access whereby capital can move freely within the region, issuers are free to raise capital anywhere in the region and investors can invest anywhere in the region'. The financial integration in the bond market takes into consideration the fluctuations in the domestic sovereign bond yields across countries and throughout time.

5.1.1 β -convergence

The β -convergence states that if the coefficient of the fixed effects model is between 0 and -1, the sovereign bond yields of ASEAN-4, India, Korea and Pakistan are converging to their benchmark, Singapore, implying a bond market integration. In Table 8 shows four specifications that assessed β -convergence during the time period 2004 to 2012. Dummy variables for ASEAN-4 and the GFC were added in order to observe if the convergence coefficient would have changed accordingly. If the ASEAN-4 dummy provided a statistical significant β -convergence, then ASEAN-4 sovereign bond market would converge differently from the other Asian EMs. The fourth column or specification (4) has the sample of ASEAN-4 only.

As shown in Table 8, the coefficient of β -convergence in all specifications are significant at 1% level. In specification (1), the Asian EMs coefficient was -0.189, however the dummy for crisis and the shift in crisis were not significant, which implied that during the GFC and afterwards there was no significant regime shift nor slope. Specification (2) added interaction dummy for ASEAN-4 without the dummy variable for the constant because it could fall under the dummy trap with the fixed effects model, the results did not support a significant slope difference. Specification (3) added two extra variables, the interaction with the crisis dummy variable and ASEAN-4 dummy with the β -convergence coefficient and displayed no significance. Although the ASEAN-4 dummy interaction was not significant, it exhibited negative coefficient of -0.033 which could imply a faster speed of convergence for ASEAN-4. Specification (4) provided the fixed effects model with only the ASEAN-4 with a significant β -convergence coefficient of -0.226 with higher degree of convergence than with the overall group. In spite of the difference, the GFC dummy is still not significant, therefore there was no regime shift, nor impact on the convergence level during this period.

The fixed effects model did not allow the dummy variable for the ASEAN-4 as a shift in constant term, it could only interact with the independent variable providing a shift

in the slope. For this reason, pooling regression was applied^{ix}. The pooling regression is not predicated in theory because pooling the data already implies the integration of the sovereign bond yields. Nevertheless, it provided a statistical understanding of the difference with the control group by adding a constant shift that the fixed effects model could not compute. All the Asian EMs did not have a significant beta convergence coefficient. However, ASEAN-4 dummy interaction with the beta convergence coefficient proved to be the only significant variable showing that the ASEAN-4 are indeed converging if it applied as a model.

5.1.2 σ - convergence

The decrease in the Domestic Sovereign Bond Yields for each country during the period under study is not as fast as the sovereign bond yields in the European Union members before the European Monetary Union in 1999. The trend is clearer for Indonesia and the Philippines that have a wider range of 9.7% and 9.467% seen in Table 5, 4, respectively, and the figure 1. The AEC Blueprint 2015 pertaining to capital markets is intended to improve regional integration, where it enables capital to move freely within the ASEAN region. The possibility of issuers raising capital in different ASEAN markets and with investors able to invest freely across ASEAN markets would capital flows and heighten capital market integration (Singh, 2009).

Figure 1 reports as well the sigma convergence of all available Asian quarterly cross sectional standard deviation on the top right. The graph enhances the difference in convergence in ASEAN-4 and the countries considered. In spite of a clear pre-crisis sigma convergence the post-crisis has delayed the sigma convergence and has stabilised around its mean of 3.5. Whereas the sigma convergence for ASEAN-4 provides a clear downward trend.

The σ -convergence in figure 1 confirms the convergence of the domestic sovereign bond yields. It shows a downward trend that is statistically significant to the 1% level. The coefficient of the regression obtained of σ against the trend which is the following $\sigma_t = 4.778 - 0.093 * T_t + \epsilon_t$ with ϵ_t being the random shocks and T the time counter. Between 2008 and 2009 a divergence was prevailing due to the start of the GFC. But the convergence continued at faster pace, and in three years the domestic sovereign bond market almost reached full convergence in theory which is when the similar assets comovements across time are the same, where the standard deviation is 0. It has the lowest standard deviation at the end of 2012 of about 0.818.

5.1.3 Discussion

The theoretical model points out to a higher speed of convergence for the ASEAN-4, even though this higher speed of convergence is not statistically different with the

^{ix}The results can be found in the Appendix A13

dummy interaction for ASEAN-4, it is significant by only using ASEAN-4 sample in the model. This finding is different from the σ -convergence that found a higher level of convergence after the GFC for ASEAN-4. Nevertheless they both do signal convergence in the Asian EMs. The fact that other Asian Sovereign bond yields are converging further enhances the idea that emerging markets are converging. Even though South Korea, India and Pakistan do not have in theory Singapore as a benchmark, because it is not their regional benchmark, the statistical property of the analysis indicates a convergence. Since Singapore has lower sovereign bond yields like the US, it is not surprising that the results are pointing towards this direction. Emerging Markets are developing their sovereign bond markets, and converging towards a benchmark, in this case scenario Singapore.

The development of the AEC Blueprint 2015 implementation plan was endorsed in April 2009 and is recognised as a milestone, due to the advocacy of regional integration through higher integrated capital market. One of the six strategic components is to strengthen bond markets by accelerating reform initiatives in bond issuance, listing and distribution. The σ -convergence concept to a certain extent enabled to capture the implementation plan, and distinguish itself from other Asian EMs. At the beginning of 2009 the sovereign bond yield spread cross sectional standard deviation decreased on average by one unit each year compared to the Asian EMs that stayed around its mean of 3.5.

5.2 Fixed Effects Model Results & Discussion

In this section, the results are discussed for the determinants of the domestic sovereign bond yields and the selected model relevant for the ASEAN-4. There are different possible econometric approaches. However, due to unavailability of data three different models were tried, namely the pooling panel regression, the random effects model and the fixed effects model.

5.2.1 Statistical Approach

My preference for the fixed effects model is based on the results given by the F test calculated to assess the data's poolability. This test allowed me to drop the pooled panel regression. The random effects model for each analysis had negative value of the unobserved effects variance estimated $\hat{\sigma}_\mu^2$ and therefore could not be calculated, unless its variance σ_μ^2 was set to zero. This is indicative of a negative serial correlation in the error term $\mu_{i,t}$, probably by a substantial amount, meaning that the assumption of conditional variances is not constant $E(\mu_{i,t}^2) \neq \sigma_\mu^2$ and conditional autocovariances are not zero $E(\mu_{i,t}\mu_{i,s}) \neq 0$. In other words the idiosyncratic errors are serially correlated so that $E(\mu_i\mu_i'|x_i, \mu_i) = \sigma_\mu^2 I_\tau$ is violated (Wooldridge, 2002, chapter 10).

The fixed effects model can incorporate or not the effects of time by including dummy variables for each time period. In order to test whether it is relevant to include time

effect, I used a Breush-Pagan Lagrange Multiplier test. The alternative hypothesis of significant time effects was rejected on all model specifications.

5.2.2 Adapting the analyses to the data

All 13 fixed effects models exhibited heteroskedasticity in the error term which made the coefficient standard errors not reliable and therefore the significance of the coefficient as well. To circumvent this inconvenience, a robust standard errors was performed according to Zeileis (2004), as firstly suggested by MacKinnon & White (1985) to improve the performance in small samples. A more extensive study of small sample behaviour was carried out by Long & Ervin (2000) which arrives at the conclusion that the third Heteroskedastic-Consistent covariance estimator (HC3) provides the best performance (in small samples), as it gives less weight to influential observations. Its off diagonal covariance elements are zero.

Multicollinearity is present when introducing the political variables that exhibit a variance inflation factor (VIF) higher than usual^x. Therefore the results for the political variables are to be looked at carefully. I preferred not to drop them but to take consideration of their standard error. In theory a VIF of 12 means a standard error for the respective coefficient of that predictor variable $\sqrt{12}$ as large as it would be if that predictor variable were uncorrelated with the other predictor variables. Also to circumvent this, the first principal component of a PCA was obtained from the political and governance indicators and the results of the fixed effects model is reported in Table 11 specification (13), but it still has high VIF.

The panel unit root test has been performed according to Im et al. (2003) for each panel variable. The foreign investor holding and the local central bank holding variables do not have stationary properties. The first difference with the previous period (one lag) is administered accordingly $\Delta x_T = x_t - x_{t-1}$ and becomes integrated in the first order I(1). It is applied in time series because the conditions of stationarity are not met to fulfill the fixed effects model. The panel variables have a unit root as shown in Table 12. The transformation of foreign participation changed the interpretation of the results. It is no longer the level of the percentage of the foreign investor debt share but rather its quarterly change that has an effect on the local currency sovereign bond yields. The *foreign local currency debt share change* is labeled as **Δ Foreign** and the *central bank share change of the country's overall debt* including local and foreign currency in the respective economy is labeled as **Δ Central Bank**.

Moreover all the political variables are non stationary, but I do not drop them. The reason is that taking the first difference to constant extrapolated variables results with zeros for the first three quarters each year. On top of that articles have used credit rating events in the same way. Furthermore if I extrapolate the data linearly it would not reflect the true value as investors already have incorporated information about the political and

^xthe criterion level proposed was 10 as a cut off value

governance indicators ahead. Also the expected government debt to GDP, the expected inflation and the expected GDP growth exhibit non-stationary properties. They have been extrapolated linearly from semi annual vintages. By extrapolating them constantly it becomes non-stationary and it is not possible to take the first difference.

Each fixed effects model specification are in the columns of Table 9. In this Table each column represents a set of different variables that have been selected according to previous literature (Arslanalp & Poghosyan, 2014; Caceres & Unsal, 2013; Peiris, 2013). Column 3 of Table 9 reports all the variables that have a significant effect on the local currency sovereign bond yields.

5.2.3 Baseline Estimation Results

In this subsection, I will discuss about the results of the fixed effects model with the average forecasted macroeconomic variables shown in Table 9. The variables of column (1) is the baseline specification. The selected variables according to Arslanalp & Poghosyan (2014) were: the 2-year short-term local currency bond yield, the expected average real GDP growth (y-o-y), the expected average inflation (y-o-y), the debt to GDP and the Central Bank participation in the debt. Added to the latter determinants, the exchange rate risk index has been introduced according to the methodology of Caceres & Unsal (2013). Rather than foreign reserves, the Special Drawing Rights (SDRs) were used as supplementary foreign exchange reserve assets which were maintained by the International Monetary Fund. According to Peiris (2013), the long-term US sovereign bond yield and the US funds rate are used for global liquidity conditions.

Most coefficients of the standard determinants of the domestic sovereign bond yields had the appropriate theoretical sign, but not all were significant. The exception was the US funds rate, the expected inflation and the ERRI which had a negative coefficient rather than positive.

The period of interest encompasses two crisis, the GFC and the European Debt Crisis, which have changed global financial conditions and increased investors risk aversion. The dummy variable captured the GFC and the European Debt Crisis regime shift. It is statistically relevant to include it in the fixed effects model; on average after the crisis, the sovereign bond yields have dropped about one percent in three years and one quarter. The GFC crisis period followed by the European Debt Crisis, have contributed to the decrease in government bond yields in ASEAN-4. It is well known that in times of uncertainty, investors change their level of risk adjusted returns to safer assets.

The global liquidity factors that influenced ASEAN-4 sovereign bond yields were significant. The US policy rate had a negative and significant impact. A 100 basis point increase in the US funds rate decreased the domestic sovereign bond yields by 56.3 basis points, which is less than half the US long-term sovereign bond yield impact of 43.5 basis point. The global financial conditions were expected to have a positive sign, meaning that more adverse international liquidity conditions and risk perception tended to

widen credit spreads in EMs. The US central bank interest rate fluctuations are priced in the ASEAN-4 domestic sovereign bond, investors seemed to use the US central bank rates as a reference. However, a rise in the US funds rate rather than increasing the sovereign bond yields, decreased it. In the Peiris (2013) study, the interest rate coefficient was positive and significant. The market shocks were perhaps the cause of such change. Similarly, Csonto & Ivaschenko (2013) also found a negative coefficient; however, by controlling the Asian countries it became significant. Furthermore, the time period analysed started from 2001 to 2013 for 18 emerging countries in three different regions. The signs could be switched depending on the risk aversion regime, with a negative sign during the high risk aversion periods, as markets flock to save heavens.

A 100 basis point increase in the 10-year US sovereign bond yield increased the ASEAN-4 local currency sovereign bond yields by about 66 basis points, which is less than the short-term local yield impact. In the correlation panel in Table 7, the 2-year local sovereign bond yield is statistically correlated with the 10-year US sovereign bond yield by 0.34. A one percent increase in the short-term 2-year domestic currency sovereign bond yields lead to an increase of about 82 basis point in the long-term 10-year sovereign bond yields. This result is ten times larger in magnitude than what was found in Arslanalp & Poghosyan (2014) for advanced economies. Given that the short-term sovereign bond yields are closely related to the monetary policy rate, this result suggested that the long-term bond yields are closely related to the monetary policy as well. Csonto & Ivaschenko (2013) found that the 3-month US treasury yields and the 10-year US sovereign bond yields were already captured by US policy rate and global risk aversion (VIX), consequently the impact of the monetary policy stance is important.

In terms of macroeconomic determinants, the 10-year domestic bond yields were negatively affected by the inflation and the year on year GDP growth. A one percent increase in the projected inflation rate decreased the long-term sovereign bond yield by about 11 basis points, and a one percent increase in the GDP growth rate decreased the sovereign bond yields by 12 basis points. However, it was not relevant statistically. Although in theory investors would rather expect a higher return if inflation is expected to rise, the return yield decreased. ASEAN-4 was not experiencing deflation and therefore I cannot see a clear reasoning behind this results, but investor irrationality. Arslanalp & Poghosyan (2014) mentioned that in practice the Fisher equation should hold, but in practice it is difficult to come up with precise measures of inflation expectations and investors may not be fully rational. Furthermore, investors were mainly domestic and a growth of foreign investors in search of higher risk adjusted returns flooded their investment in ASEAN-4 (Felman et al., 2014).

As for fiscal determinants, the government debt share to GDP has a positive and significant impact on government bond yields as expected. A one percent increase in debt to GDP ratio lead to a 4 basis point increase in the long-term domestic sovereign bond yield. This result falls in the range of other studies of 2-7 basis point, but did not include the foreign participation. The debt to GDP significantly increased sovereign bond

yields suggesting that higher levels of indebtedness reduced the ability of the government to honor its obligations in the future. Higher risk premium is therefore demanded by investors when there is higher government debt.

Surprisingly, the Exchange Rate Risk Index is not significant and does not play a role even when the dummy variable is added during and after the crisis. This is in contradiction with other studies, where the currency risk component is significant which is captured by the current account, but their dependent variable were the sovereign bond yields of foreign currency. I resorted to adding the expected average current account from the WEO vintages with no significant impact^{xi}. The result of no exchange rate risk lead to two different assumptions:

- The primary supposition was the currency risk was not relevant, it is a local currency debt with more domestic investor base of 92% on average^{xii} that did not need to repatriate their money invested. In Asia, local banks continued to be the largest players in local bond markets (Ramaswamy et al., 2004).
- The second assumption is that foreign investors overlooked the current exchange risk because of a strengthening of local currency in the long-term, which is in line with Pradhan et al. (2011) that stated the prospects for currency appreciation are conceivably stronger in ASEAN.

The panel correlation in Table 7 reported ERRI being negatively correlated with the foreign share by -0.47, foreign investors are worried about risk adjusted returns. The higher the ERRI, the lower the change in foreign participation, but it has no impact on the domestic sovereign bond yields.

Most papers include the global risk indicator and find it statistically relevant with a positive coefficient. This empirical analysis did not find it relevant, either when VIX is added separately from the dummy variable or not, like shown in specification (2). It appears that the sovereign bond market has strengthened after the crisis period, this is probably why this conflicting pathways makes the VIX index uncorrelated with the sovereign bond yields of about -0.1 throughout the period analysed. However, the pairwise correlation with many other variables are significant.

The change in the central bank share of the local and foreign currency government debt is not statistically significant with or without the categorical variable, D.crisis, which captured the period during and after the GFC. The central bank purchases of government securities, such as bonds increases the money supply. The increase in the change of central bank share of government bond is not statistically relevant but has a negative coefficient like expected. An example of the central bank's influence is with their quantitative easing schemes, it has repercussions in the financial market, and it is relatively more important in more advanced economies (Arslanalp & Poghosyan, 2014).

The change in the foreign share of the domestic debt is statistically relevant throughout

^{xi}The results are not shown

^{xii}author's own calculation from the foreign investor debt share

the period. A one percent change of Foreign participation decreased the domestic bond yields by 5.7 basis points in specification (3) which has only the relevant variables. Even though the pairwise correlation in Table 7 are close to zero and statistically not significant with the domestic sovereign bond yields, its significance is prevalent with the fixed effects during and after the GFC. According to Pradhan et al. (2011), the demand for corporate and sovereign bonds during the beginning of 2009 came from abroad, as global risk increased. It soon reached the levels approaching the peak of the 2005-2007 global boom. According to Felman et al. (2014), ASEAN-5 domestic bond market became the spare tire during the GFC which was one of the key objectives of developing the bond market after the 1997 Asian Crisis. The foreign participation has a positive impact on sovereign bond yields, and did play a non negligent role.

5.2.4 Robustness Checks

In order to check for the robustness of the result, different robustness checks were conducted. Actual data was used rather than expected macroeconomic variables. Table 10 reports the actual macroeconomic data, and Table 11 reports the relevant political indicators for the ASEAN-4 with the expectation of the variables in Table 9 specification (3).

The change in foreign participation is still relevant but during and after the crisis according to Table 10. Specification (4) does not have the dummy crisis, by introducing it in specification (5) and (6) it becomes significant with a higher magnitude than when controlling for expected macroeconomic variables. The current GDP growth is no longer significant, meaning that investors take into consideration the potential growth rather than the actual growth which in this case increased the sovereign bond yield by 4.7 in specification (4). The current inflation is also dropped and non significant. What surges from Table 10 is the importance of the crisis in the sovereign bond yields decreased. During and after the GFC the yield drops by 76.6 basis points on average. Even though the VIX index increases the yield like found in other literature, its significance was not relevant.

I conducted several robustness checks to assess the sensitivity of the key findings of specification (3) in Table 11. To make the results of this thesis more robust, the political variables that were statistically more prevalent in Eichler (2014) paper were used in Table 11 with the exception of Corruption which has not been significant in the article. The political variables were used as robust checks of the key finding. Higher levels of political stability should be associated with lower sovereign bond yields. Governments in relatively stable political regimes may over a longer time period develop and should therefore be better able to implement fiscal policies which are viable in the long run. Added to this, fewer regime changes should reduce the uncertainty of financial markets toward the goals of the government and its expertise in insuring sustainable public finances. Several empirical variables were used to measure different aspects of political

stability. Due to multicollinearity I uses each political variable one by one, and the **Governance** variable is the first principal component of all these political and governance indicators with eigenvectors of -0.35 for corruption, -0.48 for government effectiveness, -0.30 for regulatory quality, -0.60 for political stability and absence of violence, -0.43 for rule of law, 0.11 for voice and account.

The results presented robust evidence that a higher quality of governance and political indicators did not significantly impact the sovereign bond yields while controlling for specification (3), foreign participation was still relevant. However, the government effectiveness in specification (7), the political stability and absence of violence in specification (8), rule of law in specification (10), voice and account in specification (11) and corruption in specification (12) signs were positive. Higher levels of corruption may have increased the cost of doing business and economic ambiguity thus impairing economic progress and sovereign solvency. But increased levels of corruption may have boosted new businesses creation by accelerated bureaucratic procedures (essentially in the existence of inefficient government administration), which may have improved growth perspectives and sovereign solvency (Eichler, 2014). By improving the quality of governance the government could have improved fundamental prospects of its economy, lessened tax evasion, and have increased the efficacy of spending cuts and tax increases. The regulatory quality in specification (9) have negative signs driving down the sovereign bond yield. The Governance (first principal component) has a negative sign like expected, however, its standard error is about the same in order of magnitude which shows a presence of multicollinearity. In theory the political variables are significant when considering the fact that their variation indicator factor is above 10.

5.3 Remarks about the Foreign Participation

The change in Foreign participation lost its level of significance in specification (4) in Table 10, with the actual macroeconomic variables. While controlling for the crisis, it becomes significant of about -3.8 in specification (5) to - 7 basis points in specification (6). However, for all specification in Table 11, that have the baseline specification, is relevant on all counts. The change in foreign participation does matter in driving the sovereign bond yields. According to Andritzky (2012) the influx of non-resident buyers, for whom foreign bonds may have offered a diversification benefit, is often associated with a drop in yields which is a *push effect*, it could have also been that low stable yields based on sound macroeconomic fundamentals that attracted foreign buyers *pull effect*.

Figure 2 provides the foreign participation in local currency debt on the left scale with the overall debt to GDP on the right scale through time. The foreign participation increased in ASEAN-4 and sees a higher increase after the GFC. There was a small slump just after the GFC, but it regained higher growth pattern afterwards. The foreign investor confidence in the domestic sovereign bond market is therefore reinforced slightly after the

GFC. With the fixed effects model using other factors driving the sovereign bond yields, it has a positive impact (negative coefficient) on the ASEAN-4 sovereign bond yields. Figure 3 displays the change in foreign participation and the sovereign bond yields of ASEAN-4 with same scaling as to provide easier comparability between them. There were no clear trends, whether the increase in the change of the foreign participation happened before the decrease in sovereign bond yields or vice versa.

In order to find out the pulling or pushing effect, I used a **Granger Causality** test for each ASEAN-4 member. Whether the change in foreign participation in the government domestic currency debt Granger causes the sovereign bond yields to decrease or the sovereign bond yields decrease Granger causes the change in foreign participation. The results did not provide statistical evidence that the sovereign bond yields pull foreign investment nor the change in foreign participation pushed down the sovereign bond yields. The test has been performed with 35 observations and two lags. Due to small sample size, the results should be considered with caution^{xiii}.

Moreover it is possible that a higher integration in ASEAN-4 prompts higher foreign participation. There is a negative correlation between the σ -convergence and the foreign participation for each country, which suggests that the higher the convergence, the higher the foreign participation. In spite of this appealing idea it cannot be concluded that a higher degree of integration within ASEAN-5 will lead to higher foreign participation in ASEAN-4 domestic bond market. Nevertheless foreign participation has an impact in decreasing the sovereign bond yields with the fixed effects model during higher risk aversion periods. It has been noted that foreign investors increase the liquidity of sovereign bond markets because they are not buy and hold type of investors, and contribute to the sovereign bond yields decrease through higher demand. As the free flow of capital within ASEAN is gradually taking pace, foreign investors are able to increase their risk adjusted return accordingly within ASEAN.

^{xiii}There exist one Panel Granger Causality that would be more relevant to apply in this context, but due to the limited time, I resorted to Granger Causality at the individual level like performed in Arslanalp & Poghosyan (2014). The Table is not reported

6 Summary & Conclusion

The main results demonstrated a significant impact of the change in foreign participation on the domestic sovereign bond yields after the Global Financial Crisis, amid sovereign bond market integration in ASEAN-4. Furthermore, the β -convergence results extend to show a similar level of integration among the Asian Emerging Markets, and the σ -convergence depicted a higher convergence level after the Global Financial Crisis only for ASEAN-4.

This thesis contributes to the study of the determinants of domestic bond yields in emerging market, specifically in the four members of the Association of South East Asian Nations, namely Thailand, Malaysia, Indonesia and the Philippines. It contributes to the quantification of convergence in the sovereign bond market in ASEAN-5 and provides an empirical approach considering other Asian Sovereign bond yields. It also asserts that the change in the foreign share of domestic government bond has a positive (negative coefficient) impact on the government bond yields, it decreases the yields. Nonetheless, its effect is statistically significant when the dummy variable for the GFC is added with the actual macroeconomic data. Controlling for political and governance variables is not relevant statistically, but a relatively high VIF for these variables are relevant to a certain extent. There are no conclusive Granger Causality direction between the sovereign bond yields and the change in the foreign participation.

This thesis concludes that the change in the foreign participation in the government bond has an impact on sovereign bond yields. These finding could have important implications if the causality could be determined. Attracting foreign investors to buy domestic sovereign bonds could decrease the yields, and therefore, continuing financial integration and facilitating the cross border trade is beneficial for ASEAN-4, as they could borrow money at a lower rate.

To further extend the study on foreign participation in government bonds, further research could test the impact of capital market convergence on foreign participation. Also, conducting an analysis by decomposing the foreign participation into different groups, namely foreign central banks, foreign banks, foreign non-bank could provide further insight on the impact of the foreign investor base on sovereign bond yields. In addition, an emphasis on the amount of time, on average, each investor by category holds the bond could give a better understanding of the dynamics of the sovereign bond investors in domestic currency.

Table 1: Data Sources

Variable	Description	Frequency	Expected sign	Sources
<i>Dependent variable</i>				
Domestic bond yield	Long term 10 year Domestic sovereign bond yield (local currency)	quarterly		Bloomberg, generic
<i>Standard determinants</i>				
yield2	Short term 2 year Domestic sovereign bond yield (local currency)	quarterly	(+)	Bloomberg, generic
USfundsRate	The US policy rate	quarterly	(+)	Bloomberg
GDP.yoy & $\Delta E[\text{GDP.yoy}]$	The real GDP year on year growth and its expectation respectively	yearly* & semi-annual vintages*	(?)	Bloomberg, WEO As for $E[\text{GDP.yoy}]$ it is extracted from every year in April and October/September
ERRI	The Exchange Rate Risk Index measured as the methodology in Caceres & Unsal (2013)	quarterly	(+)	Bloomberg(Indices),IMF(cap reserve)
π & $\Delta E[\pi]$	It is quarter on quarter change of the Consumer Price Index to capture current Inflation or Expected Inflation accordingly	yearly* & semi-annual vintages *	(+)	Bloomberg and World Economic Outlook October 2013 (WEO). As For the $E[\pi]$ it is extracted from every year in April and October/September
govdebt.gdp & $\Delta E[\text{govdebt.gdp}]$	current Debt to GDP ratio & current debt to expected GDP ratio	yearly* semi-annual vintages*	(+)	WEO for GDP
Δ CentralBank	Domestic Central Bank overall debt share	quarterly	(-)	E[gdp] WEO semi annual vintages Arslanalp & Tsuda (2014), International Financial Statistics
<i>Political and governance indicators</i>				
goveff	Government Effectiveness	yearly**	(-)	
polstab	Political stability and Absence of Violence	yearly**	(-)	Database of Political Institutions, World Bank
regquality	Regulatory quality	yearly**	(-)	
ruleoflaw	Rule of Law	yearly**	(-)	
VoiceAcc	Voice and Accountability	yearly**	(-)	
<i>Foreign Investor Holding</i>				
Δ Foreign	change in Foreign participation of domestic debt share	quarterly	(-)	Arslanalp & Tsuda (2014), QEDS National Sources

This table provides the sources and the description of the variables used for the analyses. The sample covers the following emerging countries: Thailand, Malaysia, Indonesia and the Philippines. Quarterly frequency is used for the analyses. The period of interest is between 2004 Q1 to 2012 Q2. The * report a linear extrapolation to quarterly frequency, and ** a constant extrapolation to quarterly frequency. Δ is the first difference of the variable e.g. $\Delta x = x_t - x_{t-1}$

Table 2: Descriptive Statistics for Thailand

This table provides the descriptive statistics of the variables in Thailand over the period 2004 Q2 to 2012 Q4. The definition of the variables can be found in table 1.

	n	mean	sd	min	max	range	skew	kurtosis
yield10	34	4.258	0.831	2.659	5.940	3.281	0.198	-1.014
US10Y	34	3.552	1.073	1.634	5.136	3.503	-0.421	-1.149
yield2	34	3.202	1.011	1.413	5.180	3.767	0.393	-0.795
USfundsRate	34	1.925	2.080	0.010	5.375	5.365	0.503	-1.428
D.crisis	34	0.529	0.507	0	1	1	-0.113	-2.045
ERRI	34	-0.104	0.947	-2.974	2.496	5.470	0.028	1.808
govdebt.gdp	34	27.725	2.430	23.564	32.332	8.768	0.148	-1.220
$\Delta E[\text{govdebt.gdp}]$	34	0.020	1.147	-3.226	2.881	6.107	-0.144	0.897
π	34	3.087	2.103	-4.384	6.312	10.696	-1.323	2.949
$\Delta E[\pi]$	34	0.0004	0.257	-0.460	0.403	0.863	-0.301	-1.069
GDP.yoy	34	7.660	2.892	-0.429	11.827	12.255	-0.865	0.048
$\Delta E[\text{GDPyoy}]$	34	-0.052	0.482	-1.083	0.845	1.928	-0.046	-0.047
vix	34	19.949	8.888	11.390	44.140	32.750	1.396	1.105
Δ CentralBank	34	0.049	1.766	-5.047	4.120	9.167	-0.524	1.450
Δ Foreign	34	0.410	0.812	-1.552	2.059	3.611	-0.281	0.014
goveff	34	0.300	0.089	0.190	0.430	0.240	0.146	-1.671
polstab	34	-1.153	0.225	-1.430	-0.690	0.740	0.619	-0.517
regquality	34	0.247	0.085	0.150	0.460	0.310	1.631	1.855
ruleoflaw	34	-0.098	0.119	-0.220	0.110	0.330	0.639	-1.114
VoiceAcc	34	-0.414	0.231	-0.740	0.120	0.860	0.852	0.210
Corruption	34	-0.289	0.095	-0.420	-0.100	0.320	0.887	-0.365
Governance	34	-0.013	0.240	-0.441	0.268	0.708	-0.723	-0.879

Table 3: Descriptive Statistics for Malaysia

This table provides the descriptive statistics of the variables in Malaysia over the period 2004 Q2 to 2012 Q4. The definition of the variables can be found in table 1.

	n	mean	sd	min	max	range	skew	kurtosis
yield10	34	4.047	0.501	3.167	5.205	2.038	0.637	-0.340
US10Y	34	3.552	1.073	1.634	5.136	3.503	-0.421	-1.149
yield2	34	3.221	0.390	2.561	4.300	1.739	0.684	0.612
USfundsRate	34	1.925	2.080	0.010	5.375	5.365	0.503	-1.428
D.crisis	34	0.529	0.507	0	1	1	-0.113	-2.045
ERRI	34	-0.067	0.974	-1.804	2.535	4.339	0.869	0.659
govdebt.gdp	34	48.363	4.518	41.392	54.513	13.121	-0.107	-1.575
$\Delta E[\text{govdebt.gdp}]$	34	-0.157	2.011	-8.266	2.584	10.850	-2.067	5.685
π	34	7.280	3.849	2.567	17.891	15.324	1.446	1.286
$\Delta E[\pi]$	34	0.020	0.324	-0.625	0.475	1.100	-0.314	-1.259
GDP.yoy	34	9.599	5.210	-7.415	15.723	23.138	-1.561	2.010
$\Delta E[\text{GDPyoy}]$	34	-0.025	0.387	-1.259	0.828	2.087	-1.244	4.487
vix	34	19.949	8.888	11.390	44.140	32.750	1.396	1.105
Δ CentralBank	34	0.013	0.065	-0.125	0.166	0.291	0.339	0.226
Δ Foreign	34	0.877	1.957	-4.815	5.428	10.243	-0.524	1.181
goveff	34	1.114	0.085	1	1.250	0.250	0.013	-1.310
polstab	34	0.165	0.181	-0.070	0.550	0.620	0.825	-0.118
regquality	34	0.515	0.101	0.310	0.610	0.300	-1.104	-0.327
ruleoflaw	34	0.517	0.047	0.400	0.590	0.190	-0.852	0.976
VoiceAcc	34	-0.419	0.119	-0.550	-0.190	0.360	0.863	-0.818
Corruption	34	0.187	0.142	-0.030	0.430	0.460	-0.103	-1.246
Governance	34	-1.707	0.193	-2.001	-1.369	0.632	0.166	-1.046

Table 4: Descriptive Statistics for the Philippines

This table provides the descriptive statistics of the variables in the Philippines over the period 2004 Q2 to 2012 Q4. The definition of the variables can be found in table 1.

	n	mean	sd	min	max	range	skew	kurtosis
yield10	34	8.207	2.506	4.400	13.867	9.467	0.818	-0.384
US10Y	34	3.552	1.073	1.634	5.136	3.503	-0.421	-1.149
yield2	34	6.195	2.534	2.667	11.327	8.660	0.480	-0.919
USfundsRate	34	1.925	2.080	0.010	5.375	5.365	0.503	-1.428
D.crisis	34	0.529	0.507	0	1	1	-0.113	-2.045
ERRI	34	-0.270	0.902	-2.216	2.379	4.594	0.515	0.928
govdebt.gdp	34	49.412	8.610	40.597	67.655	27.059	0.938	-0.666
$\Delta E[\text{govdebt.gdp}]$	34	-1.023	1.808	-7.301	1.301	8.602	-1.459	2.165
π	34	7.280	3.849	2.567	17.891	15.324	1.446	1.286
$\Delta E[\pi]$	34	0.0004	0.257	-0.460	0.403	0.863	-0.301	-1.069
GDP.yoy	34	9.838	1.966	3.953	14.212	10.259	-0.677	0.937
$\Delta E[\text{GDPyoy}]$	34	0.044	0.239	-0.620	0.494	1.114	-0.666	0.902
vix	34	19.949	8.888	11.390	44.140	32.750	1.396	1.105
Δ CentralBank	34	0.042	0.875	-1.471	3.185	4.656	1.709	3.604
Δ Foreign	34	0.401	1.057	-1.158	4.610	5.768	2.462	6.613
goveff	34	-0.007	0.084	-0.200	0.080	0.280	-0.745	-0.063
polstab	34	-1.526	0.215	-1.770	-1.160	0.610	0.664	-1.259
regquality	34	-0.141	0.067	-0.260	-0.060	0.200	-0.430	-1.315
ruleoflaw	34	-0.514	0.082	-0.600	-0.360	0.240	0.766	-0.962
VoiceAcc	34	-0.057	0.045	-0.140	0.030	0.170	-0.106	-0.473
Corruption	34	-0.701	0.087	-0.810	-0.580	0.230	0.233	-1.559
Governance	34	0.836	0.187	0.525	1.056	0.531	-0.543	-1.281

Table 5: Descriptive Statistics for Indonesia

This table provides the descriptive statistics of the variables in Indonesia over the period 2004 Q2 to 2012 Q4. The definition of the variables can be found in table 1.

	n	mean	sd	min	max	range	skew	kurtosis
yield10	34	9.817	2.505	5.191	14.934	9.743	-0.093	-0.939
US10Y	34	3.552	1.073	1.634	5.136	3.503	-0.421	-1.149
yield2	34	8.598	2.804	4.477	14.802	10.325	0.570	-0.647
USfundsRate	34	1.925	2.080	0.010	5.375	5.365	0.503	-1.428
D.crisis	34	0.529	0.507	0	1	1	-0.113	-2.045
ERRI	34	0.294	1.663	-2.267	6.026	8.293	1.306	2.438
govdebt.gdp	34	36.147	11.313	23.873	60.180	36.308	0.715	-0.826
E.govdebt.gdp	34	-1.301	2.221	-6.805	1.774	8.579	-1.034	0.094
cpi	34	4.785	1.739	2.197	9.730	7.534	0.675	-0.091
E.cpi	34	-0.085	0.798	-1.825	1.525	3.350	-0.580	0.637
GDP.yoy	34	17.072	3.433	11.035	25.255	14.220	0.234	-0.946
E.GDPyoy	34	0.050	0.315	-0.875	0.655	1.530	-0.912	2.390
vix	34	19.949	8.888	11.390	44.140	32.750	1.396	1.105
Δ CentralBank	34	-0.102	0.632	-1.611	1.509	3.121	-0.090	0.365
Δ Foreign	34	0.865	1.824	-2.808	3.767	6.575	-0.174	-0.854
goveff	34	-0.299	0.071	-0.440	-0.200	0.240	-0.633	-0.568
polstab	34	-1.087	0.391	-1.870	-0.570	1.300	-0.454	-0.925
regquality	34	-0.385	0.116	-0.670	-0.280	0.390	-1.425	0.674
ruleoflaw	34	-0.677	0.076	-0.820	-0.600	0.220	-0.654	-0.969
VoiceAcc	34	-0.089	0.084	-0.290	0.030	0.320	-0.923	0.470
Corruption	34	-0.735	0.111	-0.890	-0.560	0.330	0.217	-1.409
Governance	34	0.865	0.334	0.473	1.532	1.059	0.708	-0.862

Table 6: Descriptive Statistics of the Panel Data

This table provides the descriptive statistics of the variables in the joint sample over the period 2004 Q2 to 2012 Q4. The definition of the variables can be found in table 1.

	mean	sd	median	max	range	skew	kurtosis	se
US10Y	3.552	1.061	3.831	5.136	3.503	-0.436	-1.064	0.091
yield2	5.304	2.986	4.125	14.802	13.389	1.163	0.574	0.256
USfundsRate	1.925	2.056	0.781	5.375	5.365	0.520	-1.356	0.176
D.crisis	0.529	0.501	1	1	1	-0.117	-2.001	0.043
ERRI	-0.037	1.170	-0.174	6.026	9.000	1.419	5.131	0.100
govdebt.gdp	40.412	11.717	42.863	67.655	44.092	0.209	-0.997	1.005
$\Delta E[\text{govdebt.gdp}]$	-0.615	1.905	-0.279	2.881	11.147	-1.551	3.037	0.163
π	5.608	3.499	4.805	17.891	22.274	1.479	3.595	0.300
$\Delta E[\pi]$	-0.016	0.464	0.042	1.525	3.350	-1.069	5.686	0.040
GDP.yoy	11.042	5.043	10.653	25.255	32.670	-0.126	1.226	0.432
$\Delta E[\text{GDP.yoy}]$	0.004	0.365	0	0.845	2.105	-0.747	2.649	0.031
vix	19.949	8.788	17.335	44.140	32.750	1.444	1.293	0.754
Δ CentralBank	0.0003	1.026	-0.007	4.120	9.167	-0.312	7.705	0.088
Δ Foreign	0.638	1.496	0.373	5.428	10.243	0.106	1.686	0.128
goveff	0.277	0.536	0.135	1.250	1.690	0.610	-1.024	0.046
polstab	-0.900	0.692	-1.145	0.550	2.420	0.627	-0.927	0.059
regquality	0.059	0.360	0.045	0.610	1.280	0.005	-1.225	0.031
ruleoflaw	-0.193	0.470	-0.290	0.590	1.410	0.499	-1.264	0.040
VoiceAcc	-0.244	0.220	-0.160	0.120	0.860	-0.409	-1.129	0.019
Corruption	-0.385	0.391	-0.490	0.430	1.320	0.545	-1.025	0.034
Governance	-0.005	1.076	0.370	1.532	3.533	-0.699	-0.977	0.092

Table 7: Correlation matrix with Pearson correlation Test significance

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1.yield10	0.33 ^a																				
2.US10Y	0.95 ^a	0.35 ^a																			
3.yield2	0.23 ^a	0.81 ^a	0.34 ^a																		
4.USfundsRate	-0.29 ^a	-0.79 ^a	-0.34 ^a	-0.87 ^a																	
5.D.crisis	0.15 ^c	-0.20 ^b	0.17 ^b	-0.13	0.12																
6.ERR1	0.33 ^a	0.19 ^b	0.30 ^a	0.14	-0.25 ^a	0.04															
7.govdebt.gdp	-0.29 ^a	-0.24 ^a	-0.30 ^a	-0.26 ^a	0.37 ^a	0.28 ^a	-0.14														
8.E.govdebt.gdp	0.18 ^b	0.28 ^a	0.24 ^a	0.39 ^a	-0.32 ^a	0.12	0.47 ^a	-0.13													
9.cpi	0.05	-0.03	0.04	-0.18 ^b	0.03	-0.10	0.15 ^c	-0.15 ^c	0.13												
10.E.cpi	0.62 ^a	0.23 ^a	0.68 ^a	0.34 ^a	-0.34 ^a	0.14 ^c	0.00	-0.29 ^a	0.27 ^a	-0.11											
11.GDP.yoy	0.09	0.18 ^b	0.05	0.02	-0.07	-0.38 ^a	0.11	-0.30 ^a	-0.14	0.04	-0.22 ^a										
12.E.GDP.yoy	-0.13	-0.53 ^a	-0.17 ^c	-0.52 ^a	0.56 ^a	0.23 ^a	-0.21 ^b	0.24 ^a	-0.14 ^c	-0.01	-0.11	-0.33 ^a									
13.vix	-0.10	0.03	-0.08	0.03	0.01	-0.04	0.02	-0.05	-0.05	0.10	-0.09	-0.07	-0.05								
14.Δ Central-Bank	-0.02	0.01	-0.01	-0.11	0.10	-0.47 ^a	0.03	-0.18 ^b	-0.18 ^b	0.21 ^b	-0.09	0.35 ^a	-0.15 ^c	0.02							
15.Δ Foreign	-0.71 ^a	0.03	-0.65 ^a	0.04	-0.03	-0.09	0.19 ^b	0.22 ^b	0.18 ^b	0.05	-0.39 ^a	-0.09	0.00	0.02	0.04						
16.goveff	-0.51 ^a	-0.07	-0.43 ^a	-0.03	0.03	-0.02	0.08	0.17 ^b	0.18 ^b	0.01	-0.04	-0.08	-0.04	0.08	0.83 ^a						
17.polstab	-0.80 ^a	-0.02	-0.73 ^a	0.02	0.01	-0.10	0.01	0.27 ^a	0.07	0.02	-0.49 ^a	-0.13	-0.02	0.03	0.00	0.93 ^a	0.71 ^a				
18.regquality	-0.71 ^a	0.04	-0.64 ^a	0.05	-0.06	-0.07	0.15 ^c	0.23 ^a	0.16 ^c	0.06	-0.39 ^a	-0.10	-0.05	0.03	0.02	0.98 ^a	0.84 ^a	0.95 ^a			
19.ruleoflaw	0.58 ^a	-0.08	0.46 ^a	-0.13	0.00	0.06	0.14	-0.16 ^c	0.08	-0.06	0.40 ^a	0.02	-0.08	-0.01	-0.03	-0.62 ^a	-0.34 ^a	-0.63 ^a	-0.62 ^a		
20.VoiceAcc	-0.69 ^a	0.01	-0.62 ^a	0.04	-0.07	-0.03	0.08	0.24 ^a	0.09	0.01	-0.31 ^a	-0.10	-0.08	0.01	0.03	0.94 ^a	0.85 ^a	0.93 ^a	0.96 ^a	-0.57 ^a	
21.Corruption	0.68 ^a	0.01	0.61 ^a	-0.02	0.02	0.06	-0.11	-0.22 ^a	-0.16 ^c	-0.03	0.28 ^a	0.10	0.03	-0.01	-0.05	-0.97 ^a	-0.93 ^a	-0.91 ^a	-0.98 ^a	0.55 ^a	-0.97 ^a
22.Governance																					

This table reports the Pearson pairwise correlation coefficient of the variables used in this paper excluding the dummy variable. The \hat{c} denotes significant p value at 10%; \hat{b} significant p value at 5%; \hat{a} significant p value at 1%. The panel sample covers 35 quarters over the period of 2004 Q2 to 2012 Q4, a total of 140 observations.

Table 8: β -convergence Fixed Effects Model Results

$$\Delta y_{i,t} = \alpha_i + \beta_{pre-crisis} y_{i,t-1} + \beta_{ASEAN.4} ASEAN.4 * y_{i,t-1} + \gamma DCrisis + \beta_{crisis} DCrisis * y_{i,t-1} + \sum_{l=1}^L \gamma_l \Delta y_{i,t-l} + \epsilon_{i,t}$$

	<i>Dependent variable:</i>			
	The quarterly change in Domestic Sovereign Bond Spread: $\Delta y_{i,t}$			
	(1)	(2)	(3)	(4)
Domestic Bond Yield Spread [lag]	-0.189*** (0.050)	-0.151*** (0.013)	-0.165** (0.071)	-0.226*** (0.032)
$\Delta y_{i,t-1}$	-0.058 (0.097)	-0.055 (0.094)	-0.056 (0.099)	0.037 (0.125)
$\Delta y_{i,t-2}$	-0.102 (0.071)	-0.098 (0.071)	-0.099 (0.076)	-0.064 (0.074)
$\Delta y_{i,t-3}$	0.122 (0.078)	0.126 (0.079)	0.125 (0.085)	0.261*** (0.049)
DCrisis	-0.113 (0.117)	-0.113 (0.117)	-0.097 (0.113)	-0.058 (0.209)
Domestic Bond Yield Spread [lag] *DCrisis	0.024 (0.035)	0.024 (0.035)	0.016 (0.040)	-0.034 (0.028)
Domestic Bond Yield Spread [lag] *ASEAN.4		-0.040 (0.062)	-0.033 (0.070)	
Observations	224	224	224	128
R ²	0.150	0.149	0.150	0.208
Adjusted R ²	0.141	0.141	0.141	0.191
F Statistic	6.199*** (df = 6; 211)	7.446*** (df = 5; 212)	5.310*** (df = 7; 210)	5.154*** (df = 6; 118)

This table reports the fixed effect model coefficients with the robust standard errors (HC3) in parentheses for the second model, according to the fixed effect model of the quarterly change of the spread of domestic 10 year sovereign bond yields (ASEAN-4 + Korea + India + Pakistan against their benchmark Singapore from 2004 Q2-2012 Q4) on its lag, a dummy variable with ones after the GFC(2008 Q3), its interaction effect with the control variable which is the lag of the Domestic Sovereign Bond Yield. Specification (4) only uses ASEAN-4 sample. * denotes significant p value at 10%; ** significant p value at 5%; *** significant p value at 1%.

Table 9: Fixed Panel Results: with Average Forecasted Macroeconomic Variables

<i>Dependent variable:</i>			
10 year sovereign bond yield (local currency)			
	(1)	(2)	(3)
yield2	0.822*** (0.018)	0.819*** (0.023)	0.835*** (0.029)
US10Y	0.666*** (0.090)	0.673*** (0.094)	0.651*** (0.058)
USfundsRate	-0.563*** (0.039)	-0.556*** (0.034)	-0.564*** (0.042)
$\Delta E[\text{GDPyoy}]$	-0.128 (0.092)	-0.061 (0.058)	
D.crisis	-1.059*** (0.063)	-1.133*** (0.054)	-0.990*** (0.085)
vix		0.010 (0.009)	
$\Delta E[\text{govdebt.gdp}]$	0.038 (0.058)	0.041 (0.054)	
$\Delta E[\pi]$	-0.111*** (0.038)	-0.104*** (0.029)	-0.154*** (0.032)
ERRI	0.005 (0.011)	0.007 (0.005)	
$\Delta \text{CentralBank}$	-0.062 (0.056)	-0.058 (0.057)	
$\Delta \text{Foreign}$	-0.036** (0.018)	-0.028*** (0.006)	-0.057*** (0.010)
Observations	136	136	136
R ²	0.902	0.903	0.899
Adjusted R ²	0.809	0.804	0.833
F Statistic	112.046*** (df = 10; 122)	102.651*** (df = 11; 121)	186.108*** (df = 6; 126)

This table reports the LSDV regression coefficients with the robust standard errors (HC3) in parentheses. The fixed effect model of the quarterly domestic 10 year sovereign bond yields (4 ASEAN member countries: Thailand, Malaysia, Indonesia, Phillipines from 2004 Q2-2012 Q4) on a set of variables. *denotes significant p value at 10%; ** significant p value at 5%; *** significant p value at 1%. This table reports the expectations of Inflation and real GDP growth year on year extracted from each World Economic Outlook semi annual vitage.

Table 10: Fixed Panel Results: with Actual Macroeconomic Variables

<i>Dependent variable:</i>			
10 year sovereign bond yield (local currency)			
	(4)	(5)	(6)
yield2	0.712*** (0.043)	0.723*** (0.052)	0.781*** (0.027)
US10Y	0.756*** (0.059)	0.718*** (0.076)	0.647*** (0.054)
USfundsRate	-0.371*** (0.059)	-0.447*** (0.011)	-0.496*** (0.016)
GDP.yoy	0.047** (0.022)	0.034 (0.029)	
govdebt.gdp	0.036*** (0.010)	0.030* (0.016)	0.016** (0.008)
D.crisis		-0.633** (0.282)	-0.766*** (0.190)
vix		0.016 (0.010)	
π	-0.035 (0.023)	-0.030 (0.024)	
ERRI	0.035 (0.033)	0.034 (0.044)	
Δ CentralBank	-0.103 (0.066)	-0.088 (0.075)	
Δ Foreign	-0.059* (0.034)	-0.038** (0.016)	-0.070*** (0.016)
Observations	136	136	136
R ²	0.901	0.908	0.899
Adjusted R ²	0.815	0.808	0.833
F Statistic	124.362*** (df = 9; 123)	108.959*** (df = 11; 121)	187.861*** (df = 6; 126)

This table reports the regression coefficients with the robust standard errors (HC3) in parentheses. The fixed effect model of the quarterly domestic 10 year sovereign bond yields (4 ASEAN member countries: Thailand, Malaysia, Indonesia, Phillipines from 2004 Q2-2012 Q4) on a set of variables (actual data at time t). *denotes significant p value at 10%; ** significant p value at 5%; *** significant p value at 1%.

Table 11: Fixed Panel Results: with Expected Variables and Political & Governance Indicators

	<i>Dependent variable:</i>						
	(7)	(8)	(9)	(10)	(11)	(12)	(13)
yield2	0.836*** (0.040)	0.845*** (0.043)	0.830*** (0.030)	0.843*** (0.029)	0.839*** (0.032)	0.840*** (0.029)	0.844*** (0.043)
US10Y	0.651*** (0.061)	0.661*** (0.045)	0.634*** (0.051)	0.649*** (0.058)	0.654*** (0.062)	0.671*** (0.058)	0.659*** (0.046)
USfundsRate	-0.564*** (0.042)	-0.567*** (0.046)	-0.547*** (0.024)	-0.565*** (0.047)	-0.538*** (0.065)	-0.553*** (0.049)	-0.569*** (0.043)
D.crisis	-0.991*** (0.080)	-0.972*** (0.164)	-0.966*** (0.085)	-0.949*** (0.142)	-0.886*** (0.199)	-0.872*** (0.211)	-0.974*** (0.150)
$\Delta E[\pi]$	-0.155*** (0.041)	-0.158*** (0.027)	-0.165*** (0.051)	-0.159*** (0.033)	-0.137*** (0.029)	-0.124*** (0.023)	-0.156*** (0.026)
goveff	0.032 (0.742)						
polstab		0.177 (0.331)					
regquality			-0.610 (0.475)				
ruleoflaw				0.607 (0.510)			
VoiceAcc					0.431 (0.420)		
Corruption						0.661 (0.573)	
Governance							-0.164 (0.311)
Δ Foreign	-0.057*** (0.009)	-0.055*** (0.013)	-0.056*** (0.012)	-0.053*** (0.010)	-0.056*** (0.015)	-0.057*** (0.010)	-0.055*** (0.011)
Observations	136	136	136	136	136	136	136
R ²	0.899	0.899	0.899	0.899	0.899	0.900	0.899
Adjusted R ²	0.826	0.826	0.827	0.827	0.827	0.827	0.826
F Statistic (df = 7; 125)	158.257***	159.214***	159.740***	159.386***	159.699***	160.513***	158.937***

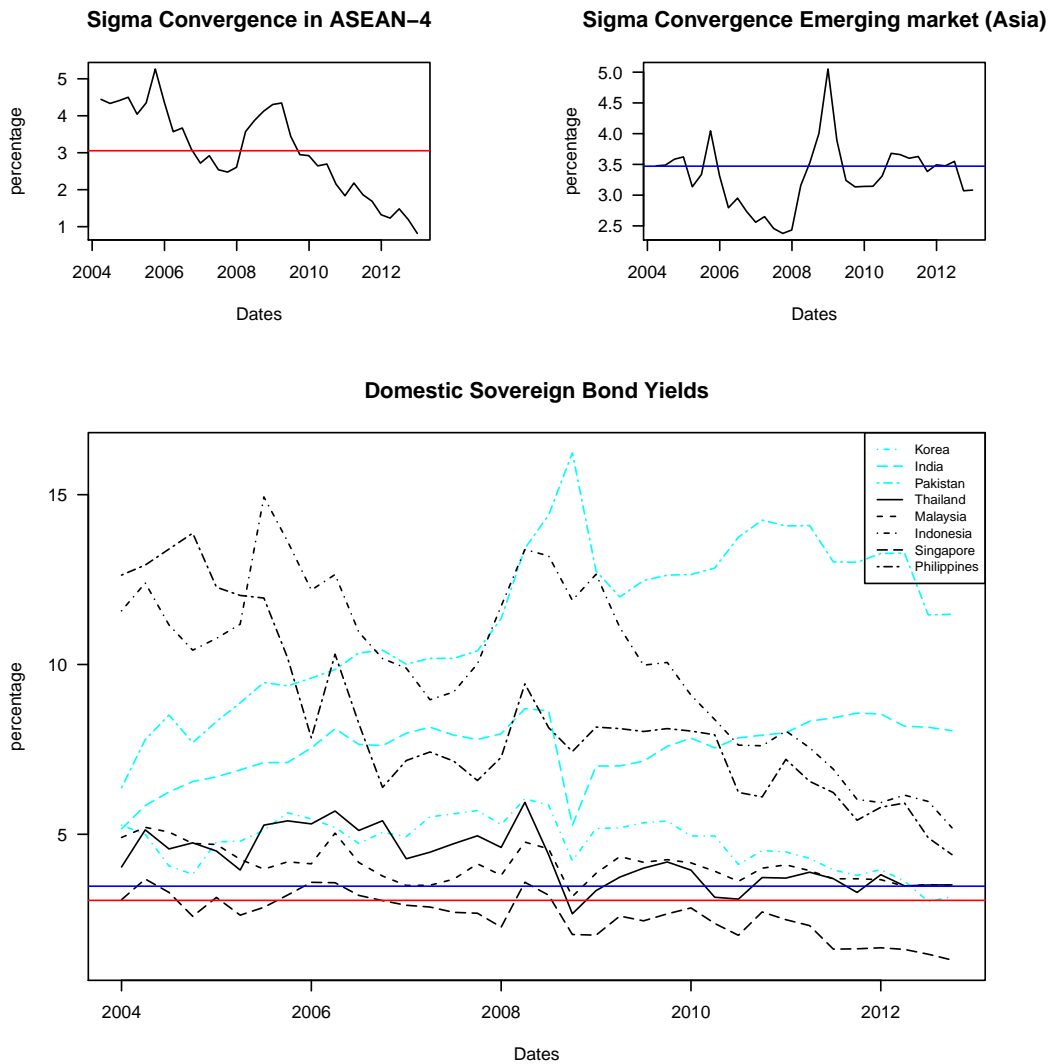
This table reports results from the fixed effect model of the quarterly domestic 10 year sovereign bond yields (4 ASEAN member countries: Thailand, Malaysia, Indonesia, Philippines from 2004 Q2-2012 Q4) on a set of significant variables controlling for political variables. The robust standard errors (HC3) are reported in parenthesis. * denotes significant p value at 10%, ** significant p value at 5%, *** significant p value at 1%. This table reports the expectations of Inflation and real GDP growth year on year extracted from each World Economic Outlook semi annual vintage.

Table 12: Panel Unit Root Test

	constant	with trend
yield10	TRUE	TRUE
yield2	FALSE	TRUE
US10Y	FALSE	TRUE
USfundsRate	FALSE	TRUE
vix	TRUE	TRUE
ERRI	TRUE	TRUE
GDP.yoy	FALSE	TRUE
E[GDPyoy]	FALSE	FALSE
$\Delta E[\text{GDPyoy}]$	TRUE	TRUE
π	TRUE	TRUE
E[π]	FALSE	FALSE
$\Delta E[\pi]$	TRUE	TRUE
govdebt.gdp	FALSE	TRUE
E[<i>govdebt.gdp</i>]	FALSE	FALSE
$\Delta E[\text{govdebt.gdp}]$	TRUE	TRUE
$\frac{\text{ForeignParticipation}}{\text{localgovdebt}}$	TRUE	FALSE
$\Delta \text{Foreign}$	TRUE	TRUE
$\frac{\text{DomesticCentralBank}}{\text{govdebt}}$	FALSE	FALSE
$\Delta \text{CentralBank}$	TRUE	TRUE
Corruption	FALSE	FALSE
goveff	FALSE	FALSE
polstab	FALSE	FALSE
regquality	FALSE	FALSE
ruleoflaw	FALSE	FALSE
VoiceAcc	FALSE	FALSE
Governance	FALSE	FALSE

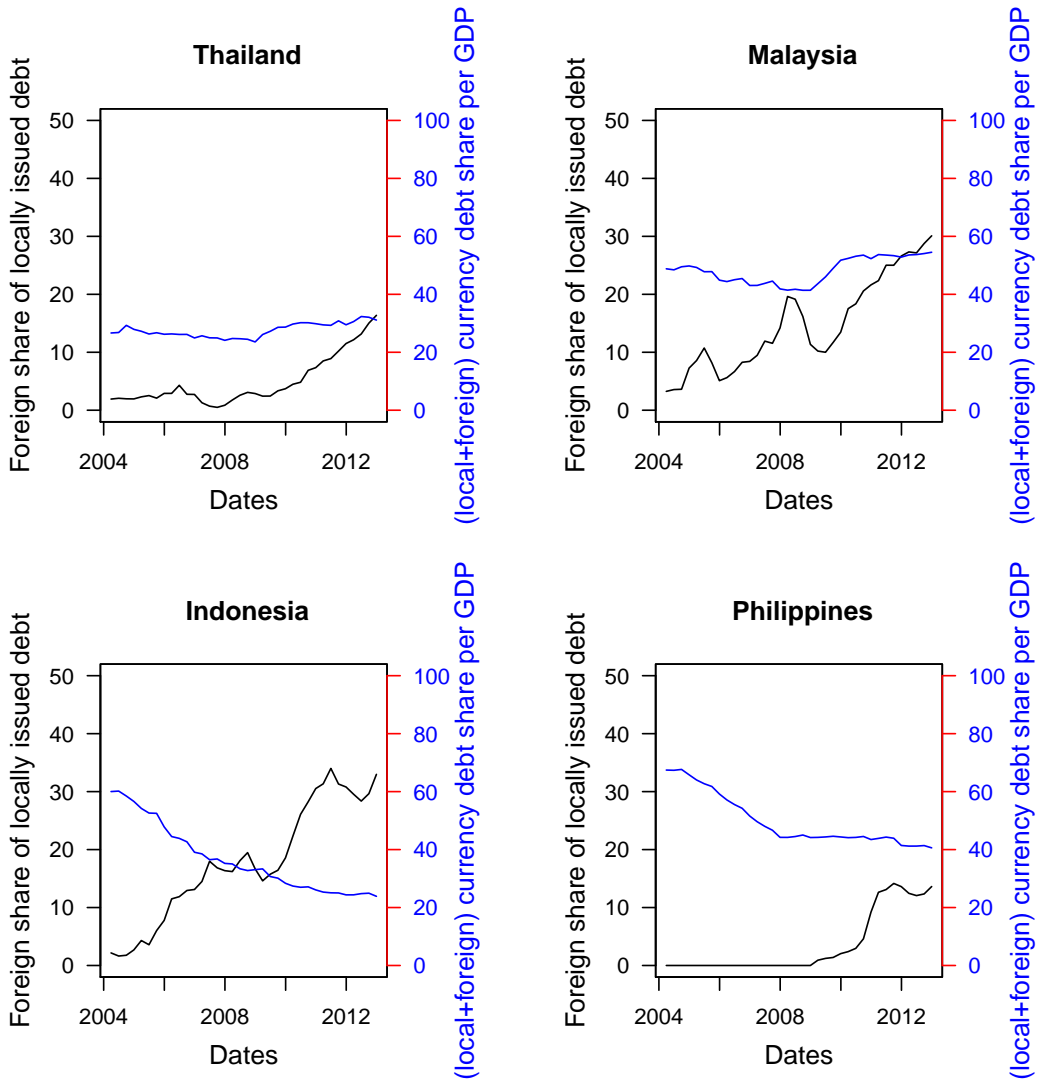
This table reports the Panel Unit Root test in the presence of cross section dependence according to Im et al. (2003) for constant and trend. If True the p value is below 5% the alternative hypothesis of "no presence of unit root" is *not rejected*. If False the panel variable is statistically non stationary at 5% level. Integration of order one I(1) eg: $\Delta x = x_t - x_{t-1}$.

Figure 1: σ -convergence: Asian Emerging Markets



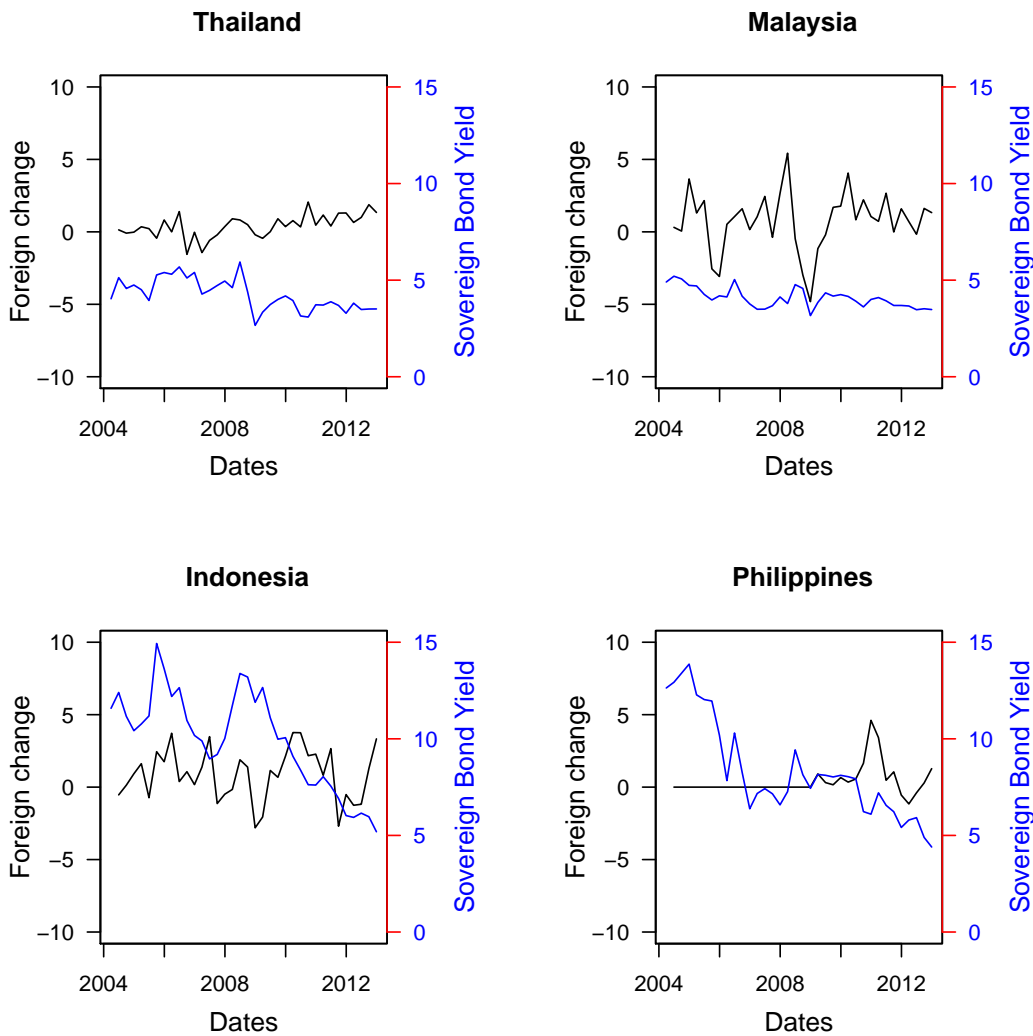
The top graphs presents the σ -convergence plotted against its benchmark through time. The top left considers only the ASEAN-4, whereas the top right considers all Asian Emerging Markets (ASEAN-4, South Korea, India and Pakistan). The bottom graph, plots the Domestic Sovereign Bond Yields of each country through time. The horizontal line in each graph provides the mean of the cross sectional standard deviation which is the mean of the σ -convergence through time. For ASEAN-4 it is in red, whereas the other Asian Emerging Markets considered are in light blue.

Figure 2: Foreign Participation in Domestic Debt and Government Debt to GDP



This graph represents the foreign participation in domestic debt expressed in percentage in black scaled on the left side of each graph. The debt to GDP is in percentage, in blue and scaled on the right side of each graph from 2004 Q2 to 2012 Q4.

Figure 3: Change in Foreign participation & Sovereign bond yields



This graph represents the quarterly change in foreign debt participation in black, scaled on the left side of each graph. The domestic sovereign bond yield is in percentage, in blue and scaled on the right side of each graph from 2004 Q2 to 2012 Q4.

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Appendices

Appendix A Beta Convergence by Pooling the Data

Table A13: β -convergence Pooling Model Results

$$\Delta y_{i,t} = \alpha + \beta_{pre-crisis} y_{i,t-1} + \gamma_{ASEAN.4} ASEAN.4 * y_{i,t-1} + \gamma_{DCrisis} DCrisis * y_{i,t-1} + \sum_{l=1}^L \gamma_l \Delta y_{i,t-l} + \epsilon_{i,t}$$

	<i>Dependent variable:</i>			
	The quarterly change in Domestic Sovereign Bond Spread: $\Delta y_{i,t}$			
	(1)	(2)	(3)	(4)
Domestic Bond Yield Spread [lag]	-0.058 (0.051)	-0.014 (0.016)	-0.007 (0.033)	-0.063** (0.025)
$\Delta y_{i,t-1}$	-0.095 (0.090)	-0.115 (0.099)	-0.116 (0.098)	-0.083 (0.089)
$\Delta y_{i,t-2}$	-0.119** (0.058)	-0.143** (0.065)	-0.143** (0.064)	
$\Delta y_{i,t-3}$	0.125* (0.071)	0.098 (0.070)	0.099 (0.073)	
DCrisis	-0.228 (0.178)		-0.086 (0.145)	-0.101 (0.121)
Domestic Bond Yield Spread [lag]*DCrisis	0.037 (0.050)		-0.002 (0.040)	0.002 (0.025)
ASEAN.4		-0.009 (0.170)	0.024 (0.122)	
Domestic Bond Yield Spread [lag]*ASEAN.4		-0.056 (0.038)	-0.063*** (0.024)	
Constant	0.282 (0.175)	0.179 (0.140)	0.205 (0.130)	0.232* (0.122)
Observations	224	224	224	136
R ²	0.071	0.102	0.105	0.059
Adjusted R ²	0.069	0.099	0.101	0.057
F Statistic	2.754** (df = 6; 217)	4.095*** (df = 6; 217)	3.153*** (df = 8; 215)	2.064* (df = 4; 131)

This table reports the pooling model coefficients with the robust standard errors (HC3) in parentheses for the second model, according to the fixed effect model of the quarterly change of the spread of domestic 10 year sovereign bond yields (ASEAN-4 + Korea + India + Pakistan against their benchmark Singapore from 2004 Q2-2012 Q4) on its lag, a dummy variable with ones after the GFC(2008 Q3), its interaction effect with the control variable which is the lag of the Domestic Sovereign Bond Yield. Specification (4) only uses ASEAN-4 sample. *denotes significant p value at 10%; ** significant p value at 5%; *** significant p value at 1%.

Appendix B Plots of Domestic Bond Yields & Determinants

Figure B4: US Long-Term (10-year) Sovereign Bond Yield

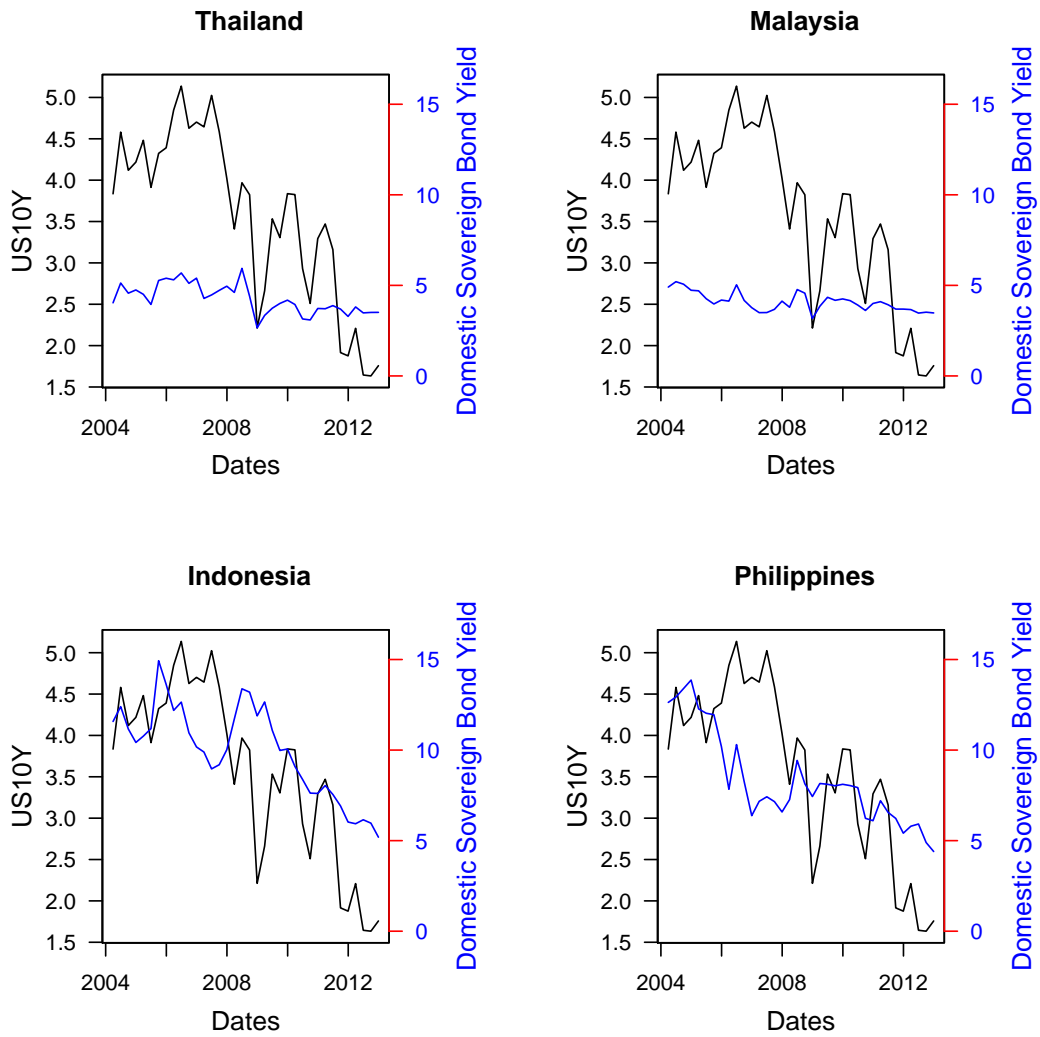


Figure B5: Short-Term Yield (2-year)

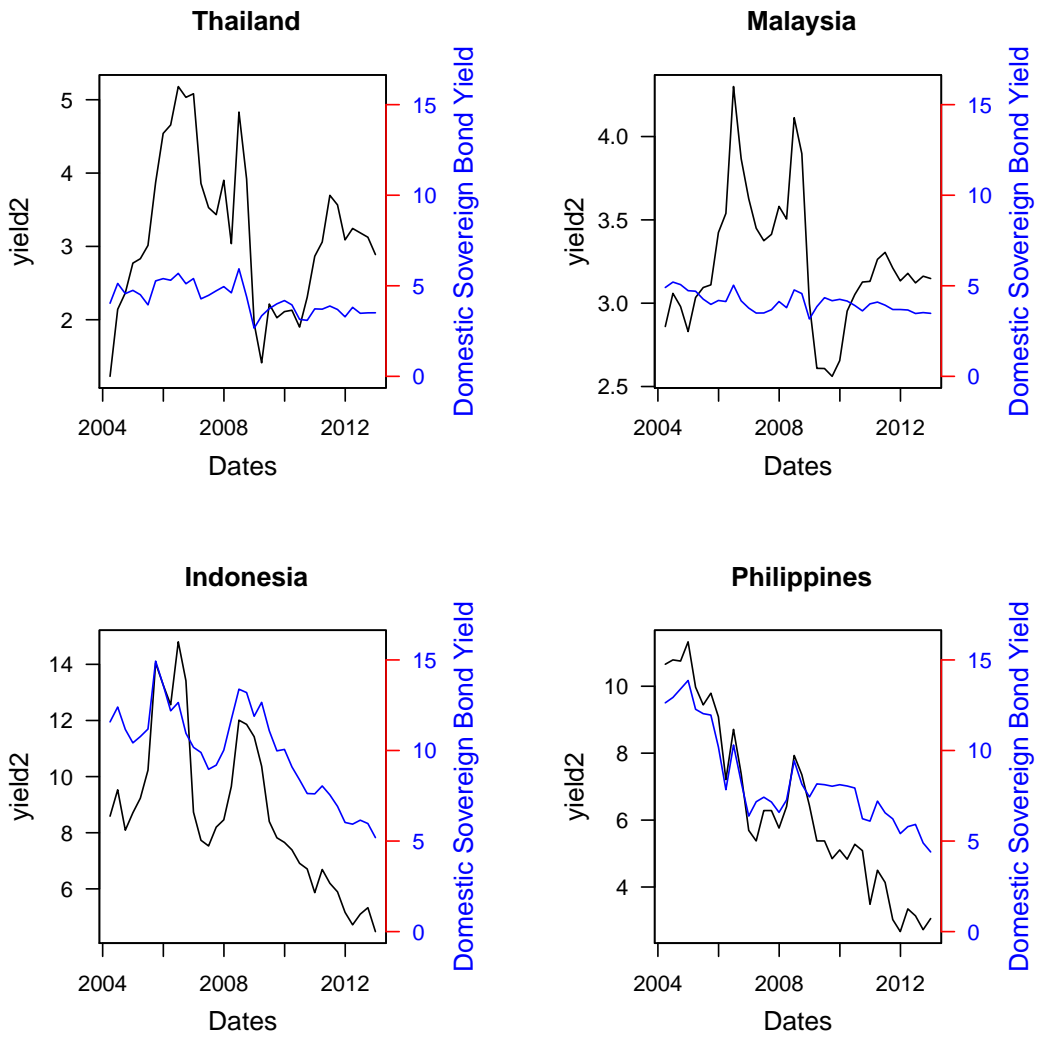


Figure B6: US Funds Rate

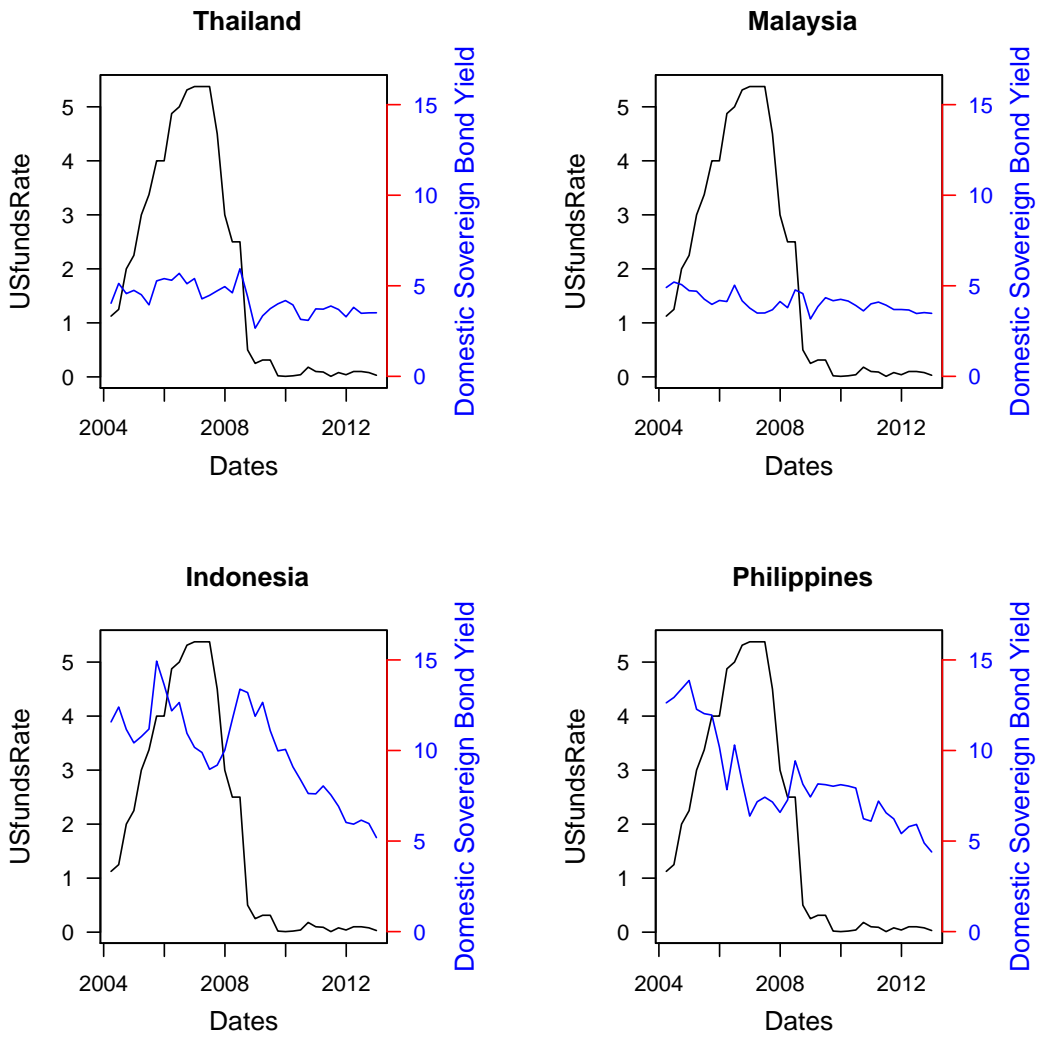


Figure B7: Inflation (π)

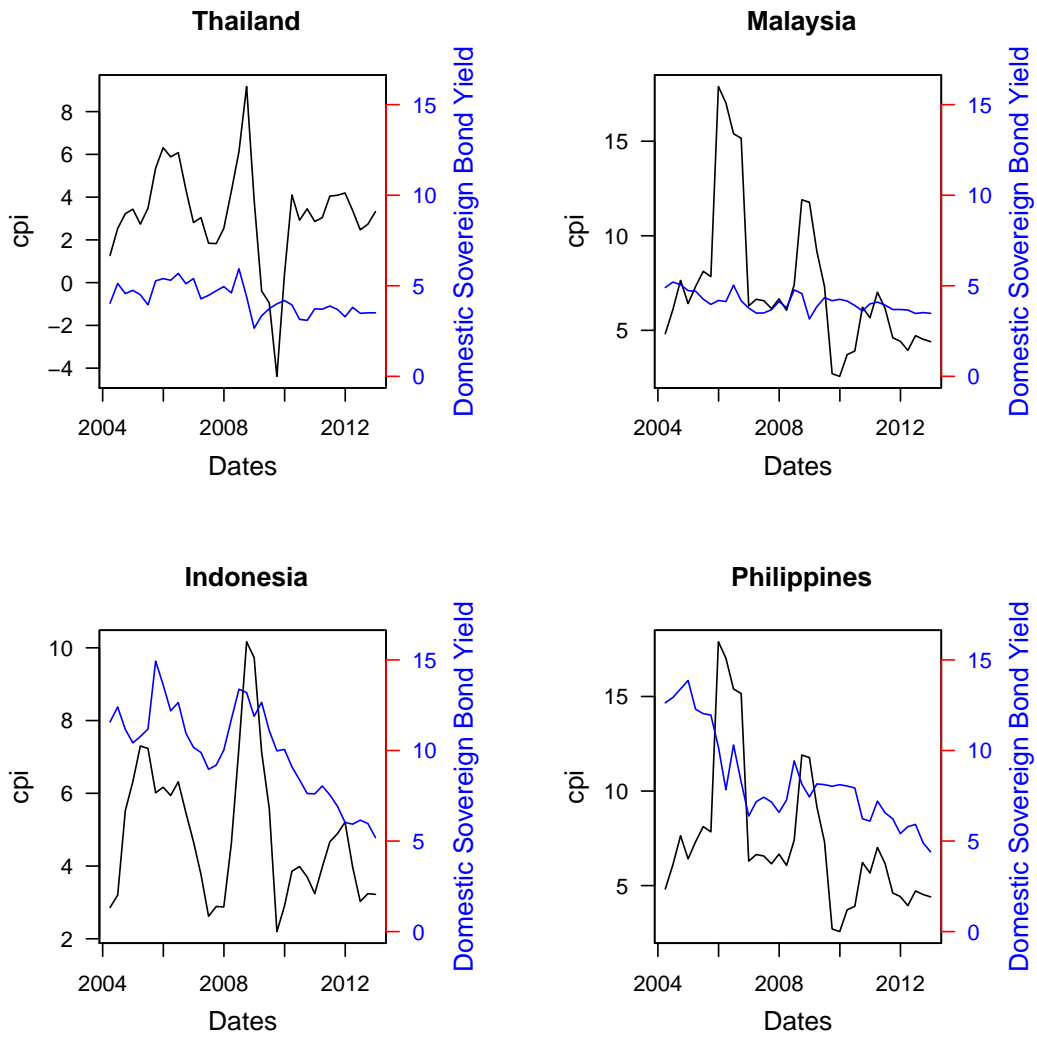


Figure B8: Δ Expected Inflation(π)

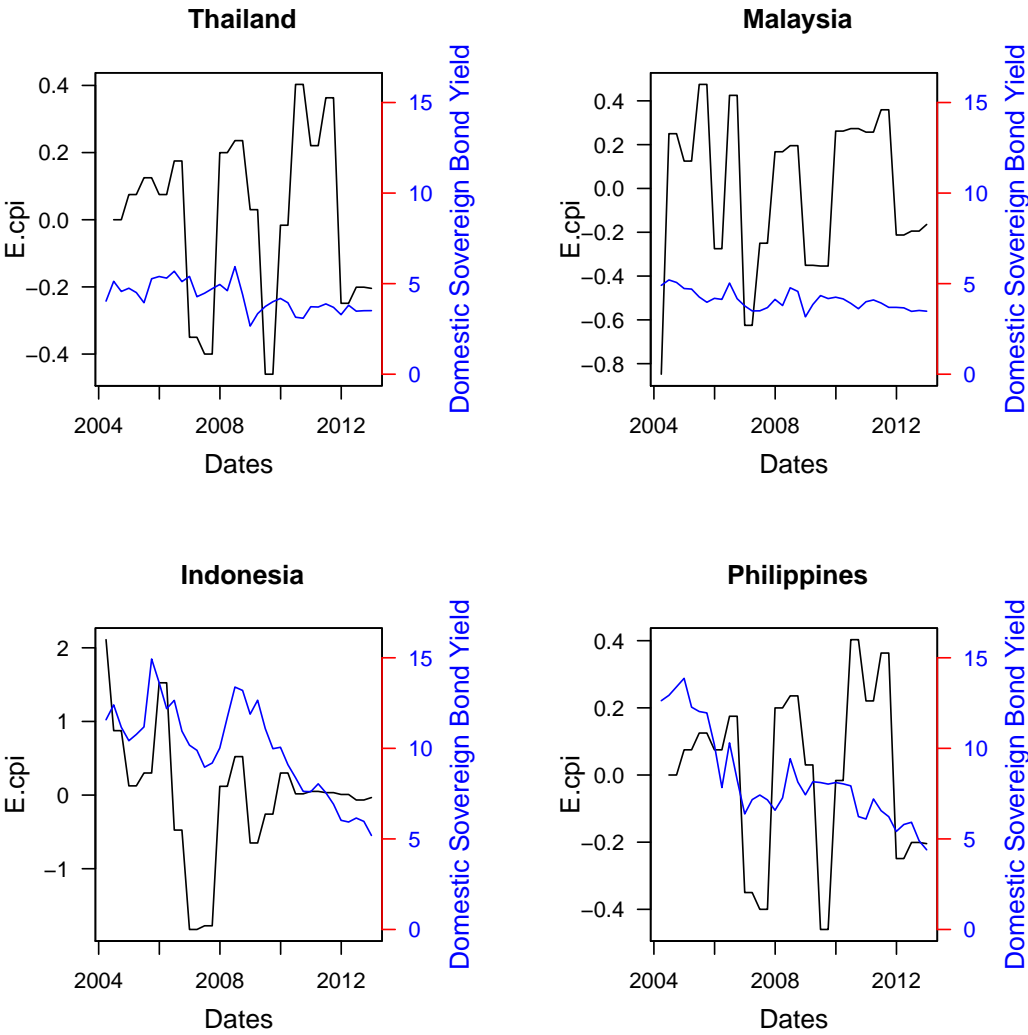


Figure B9: Debt to GDP

Figure B10: Δ Current Debt to Expected GDP

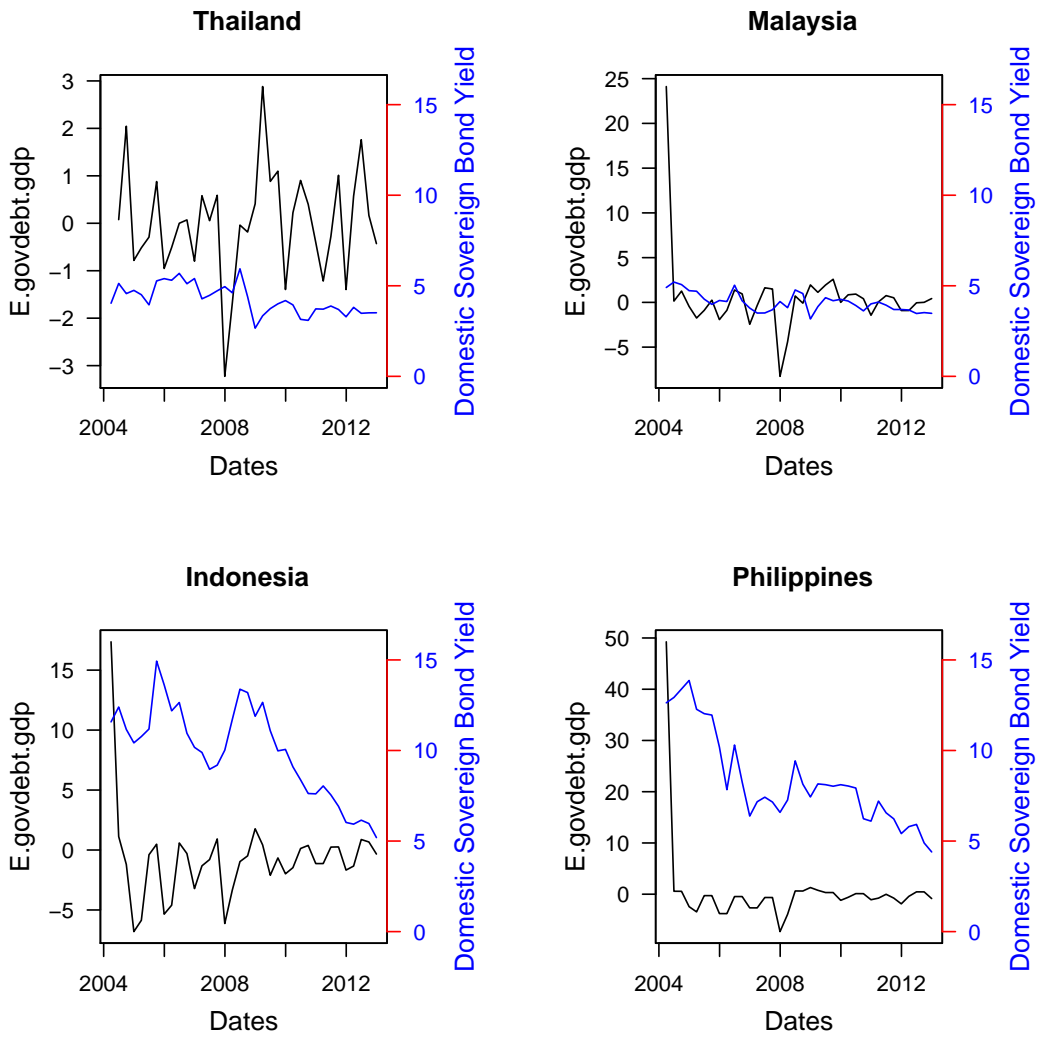


Figure B11: Real GDP Growth

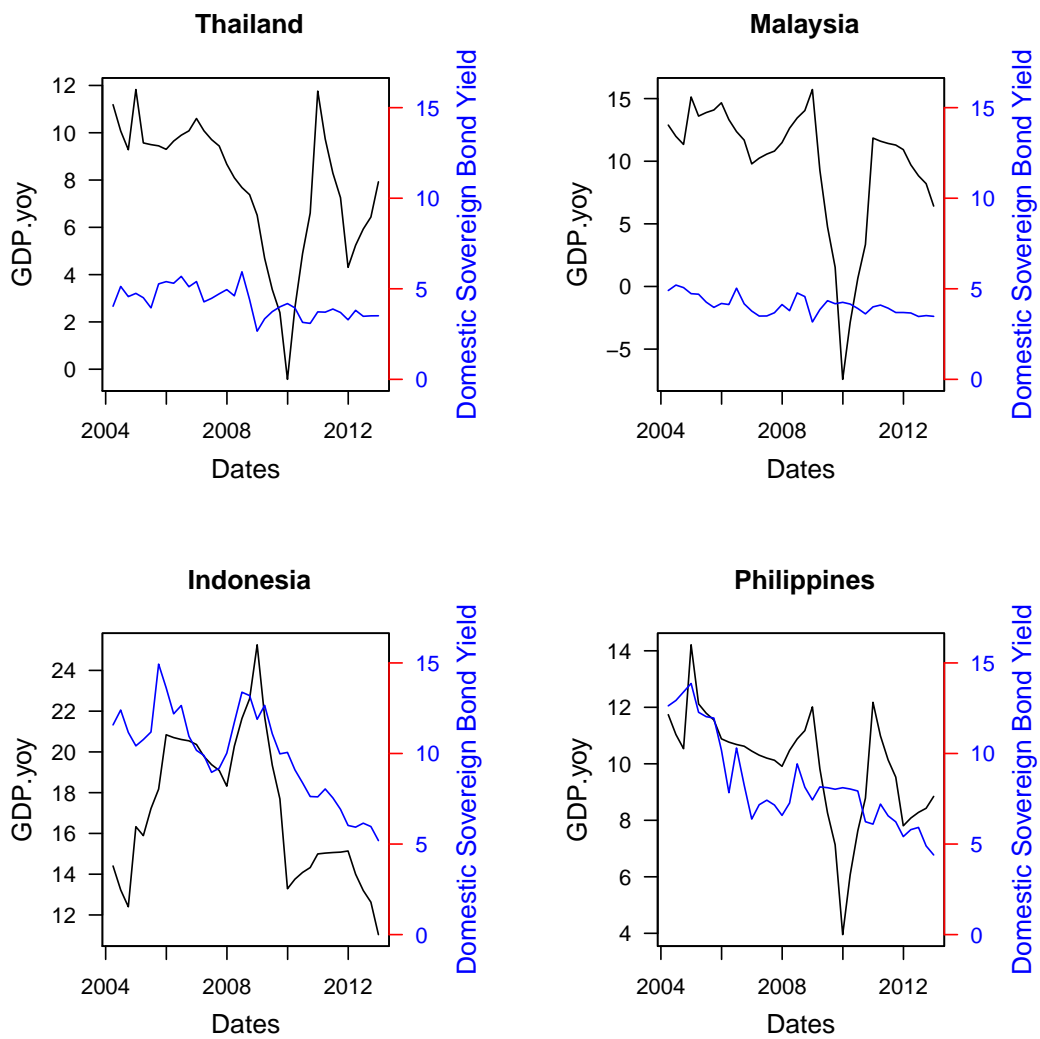


Figure B12: real Δ Expected GDP Growth

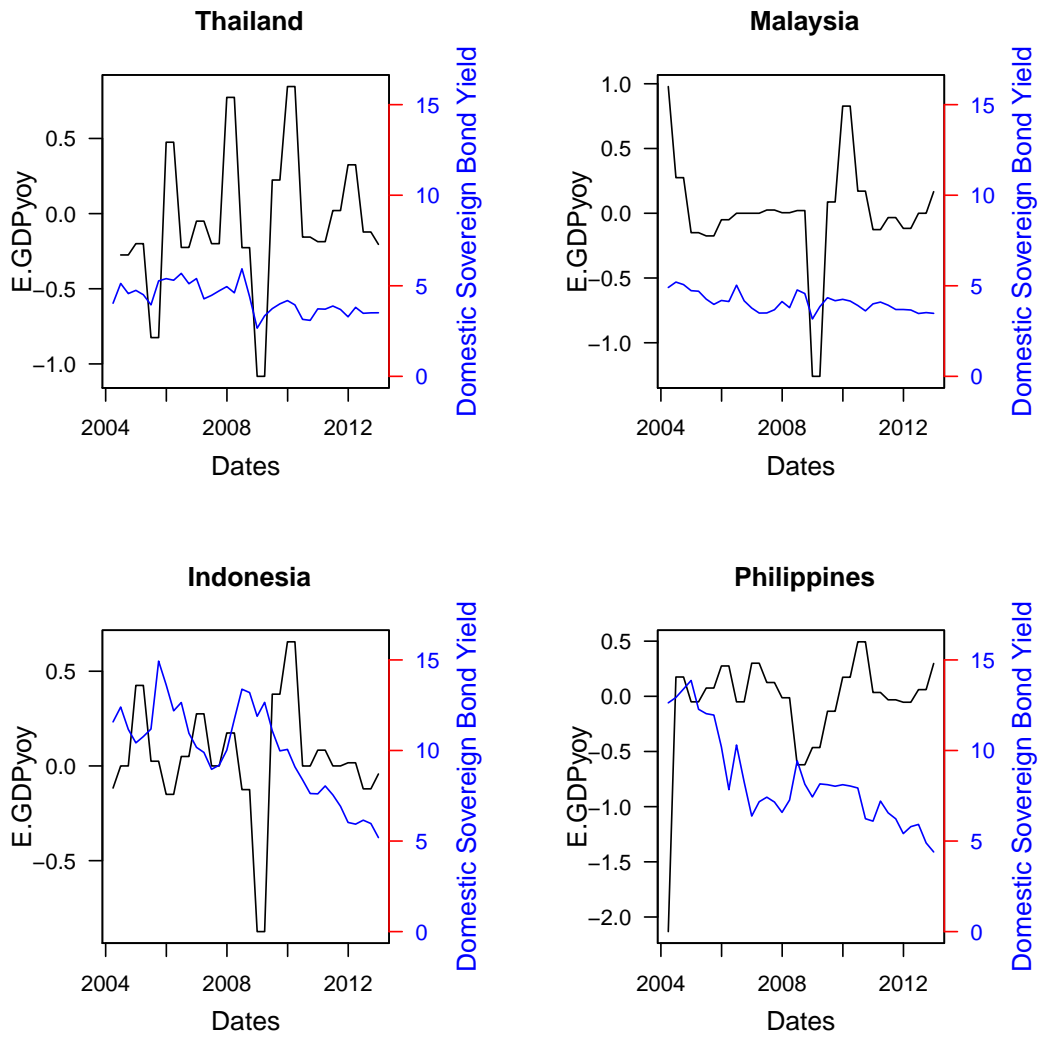


Figure B13: ERRI

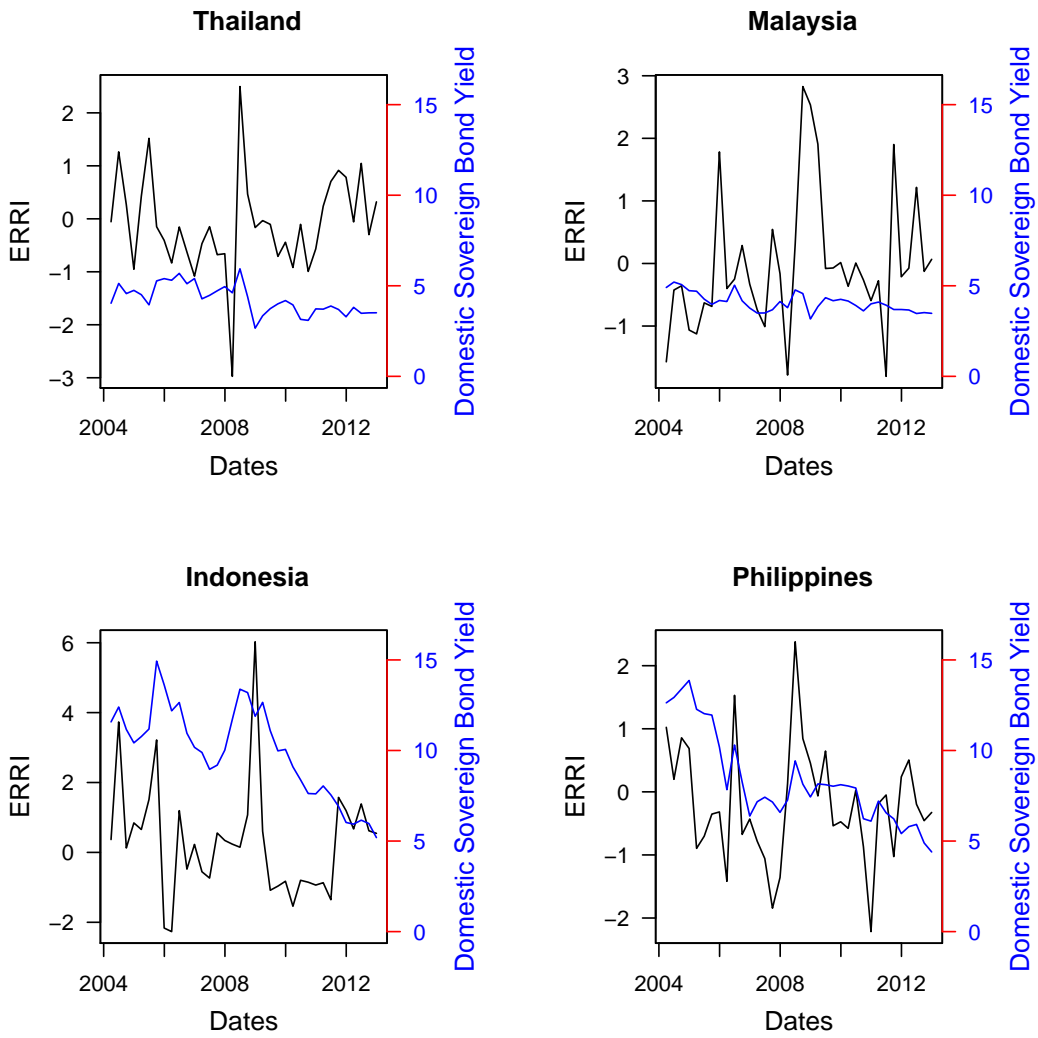


Figure B14: VIX

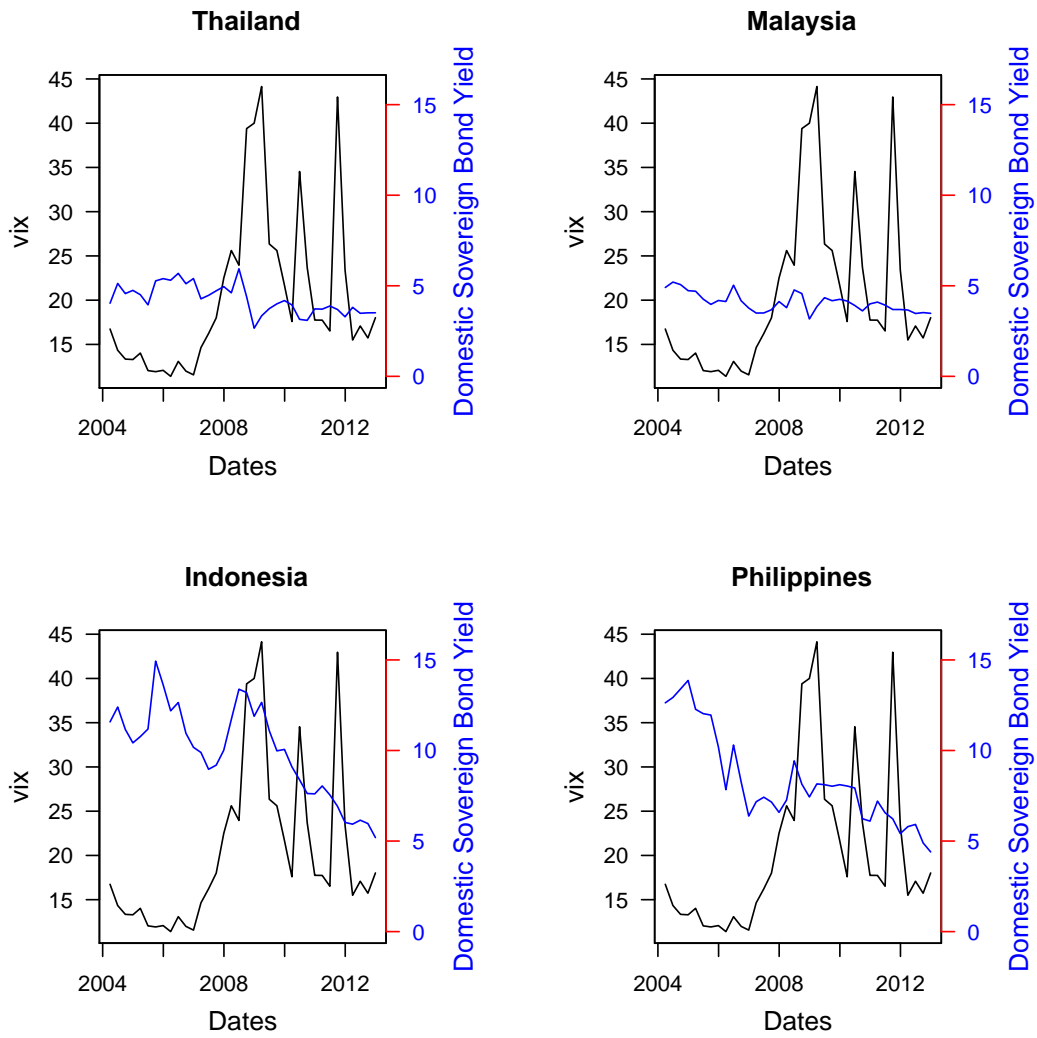


Figure B15: Δ Central Bank

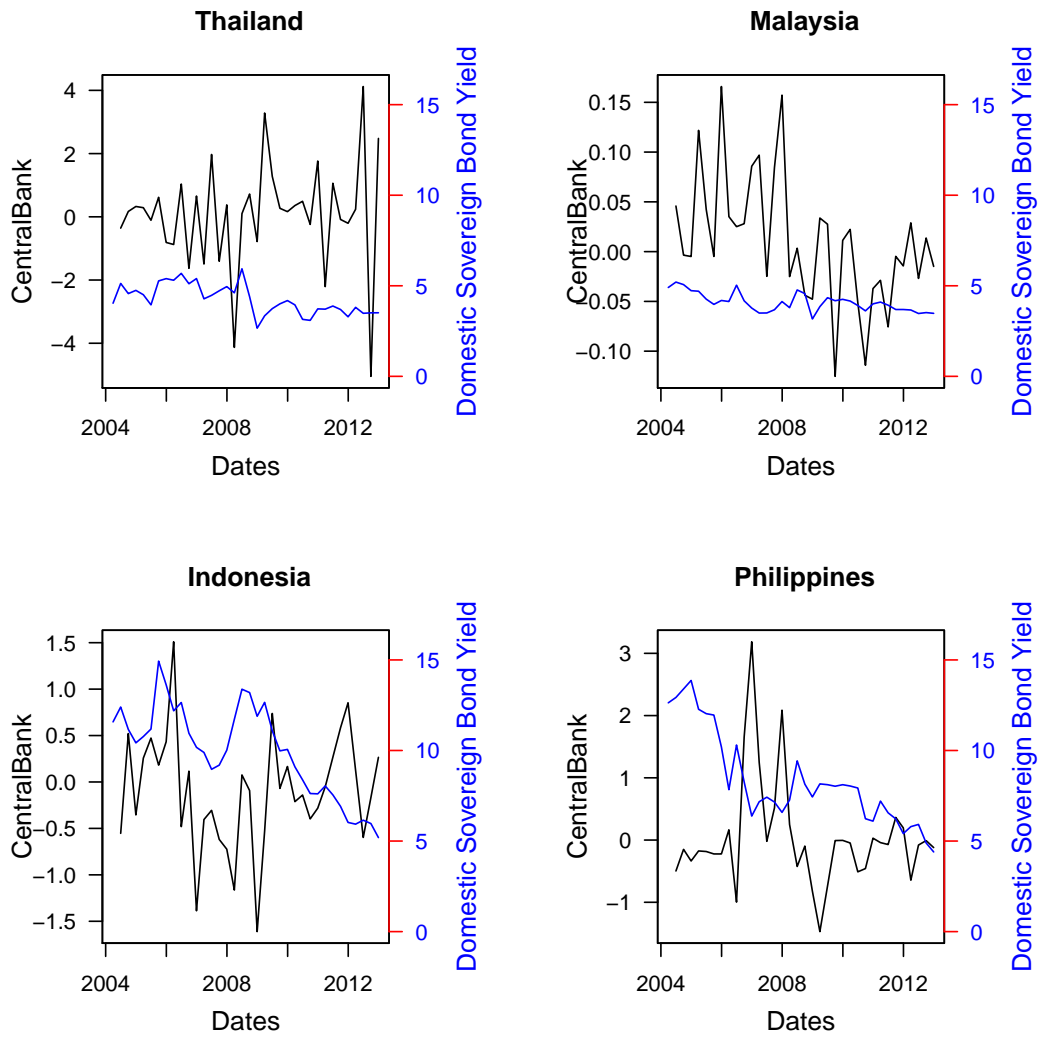


Figure B16: Δ Foreign Participation

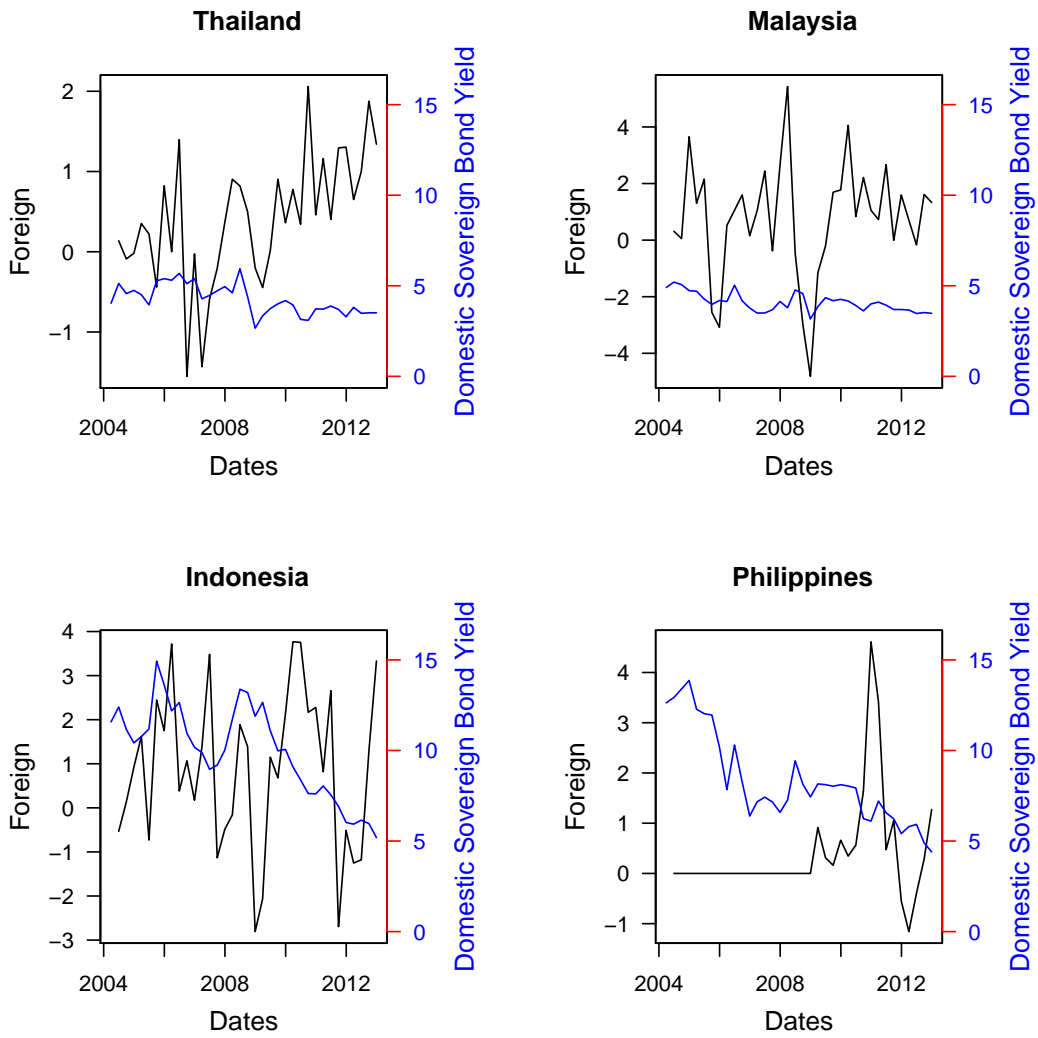


Figure B17: Government Effectiveness

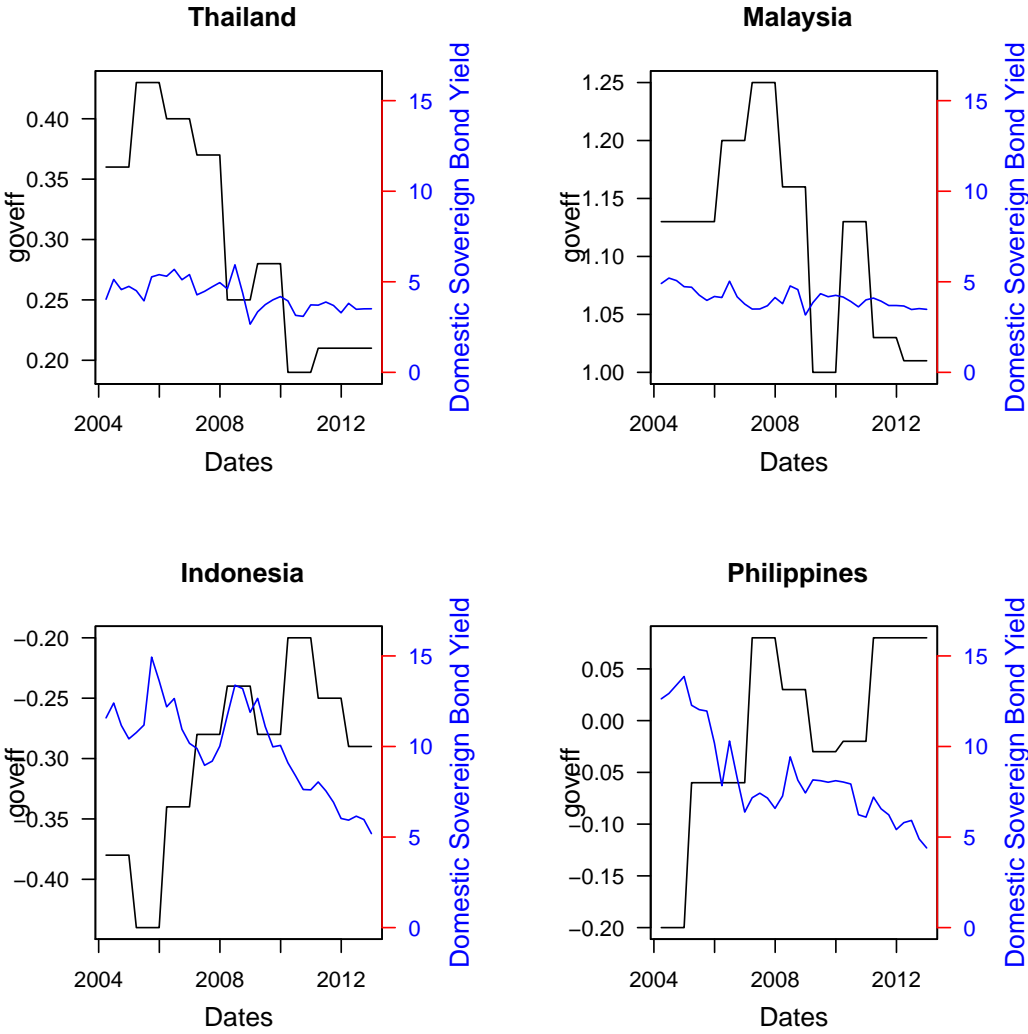


Figure B18: Regulatory Quality

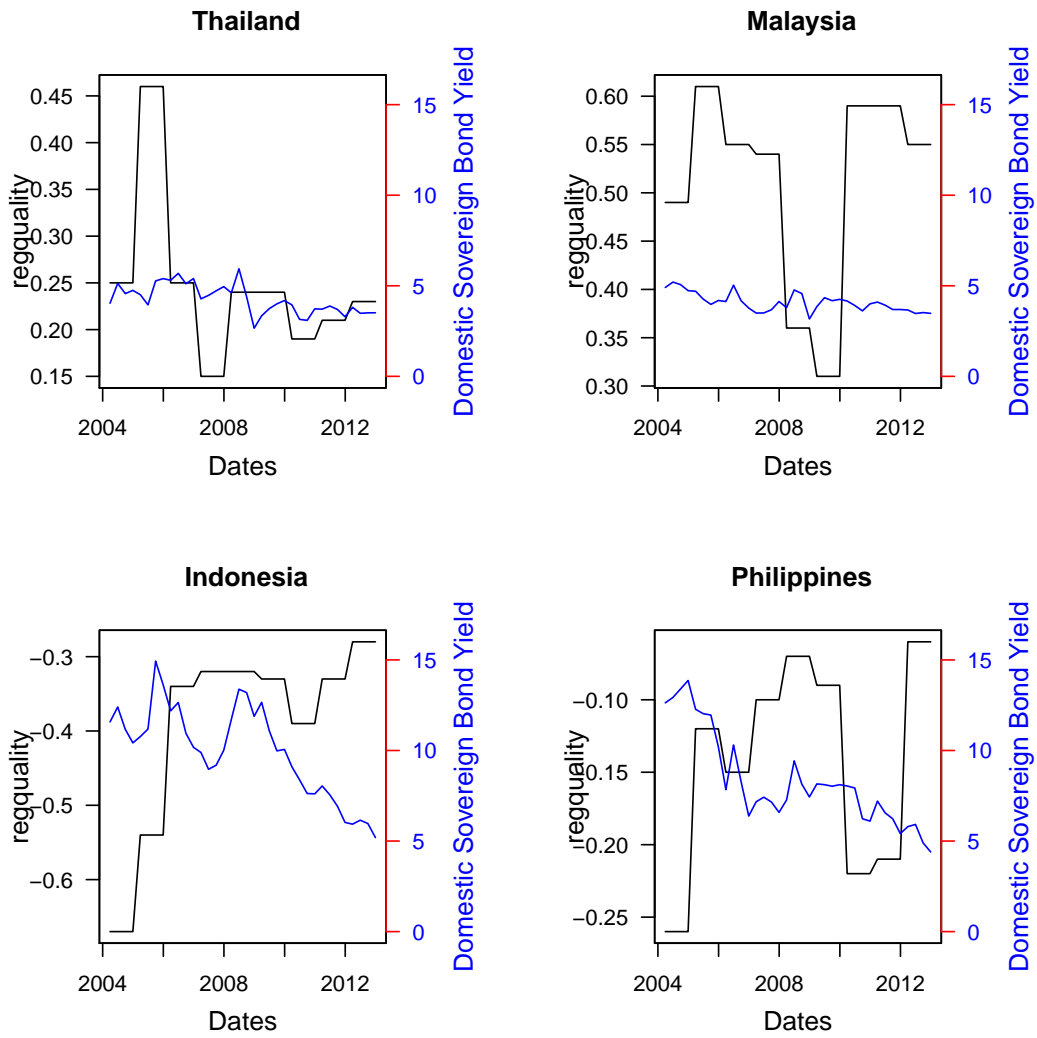


Figure B19: Voice and Account

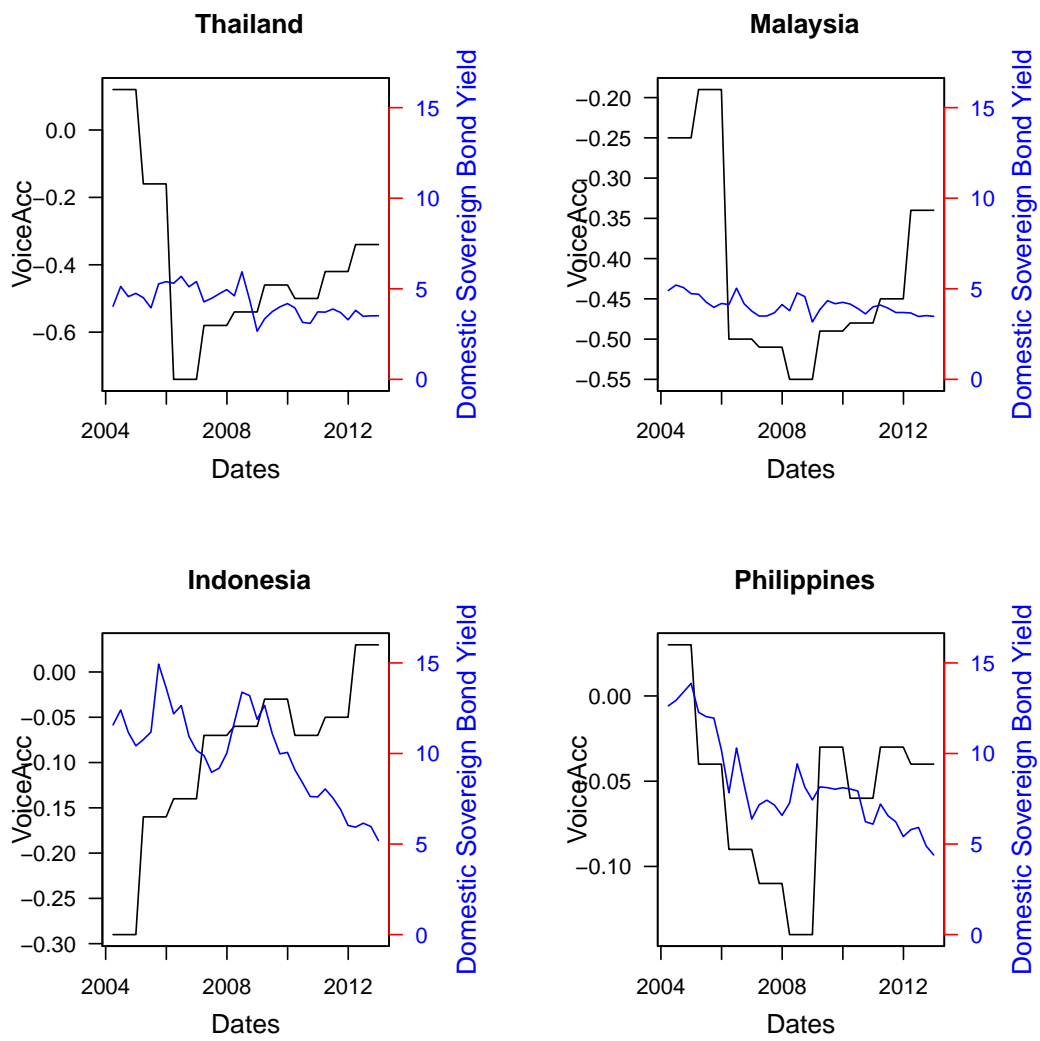


Figure B20: Corruption

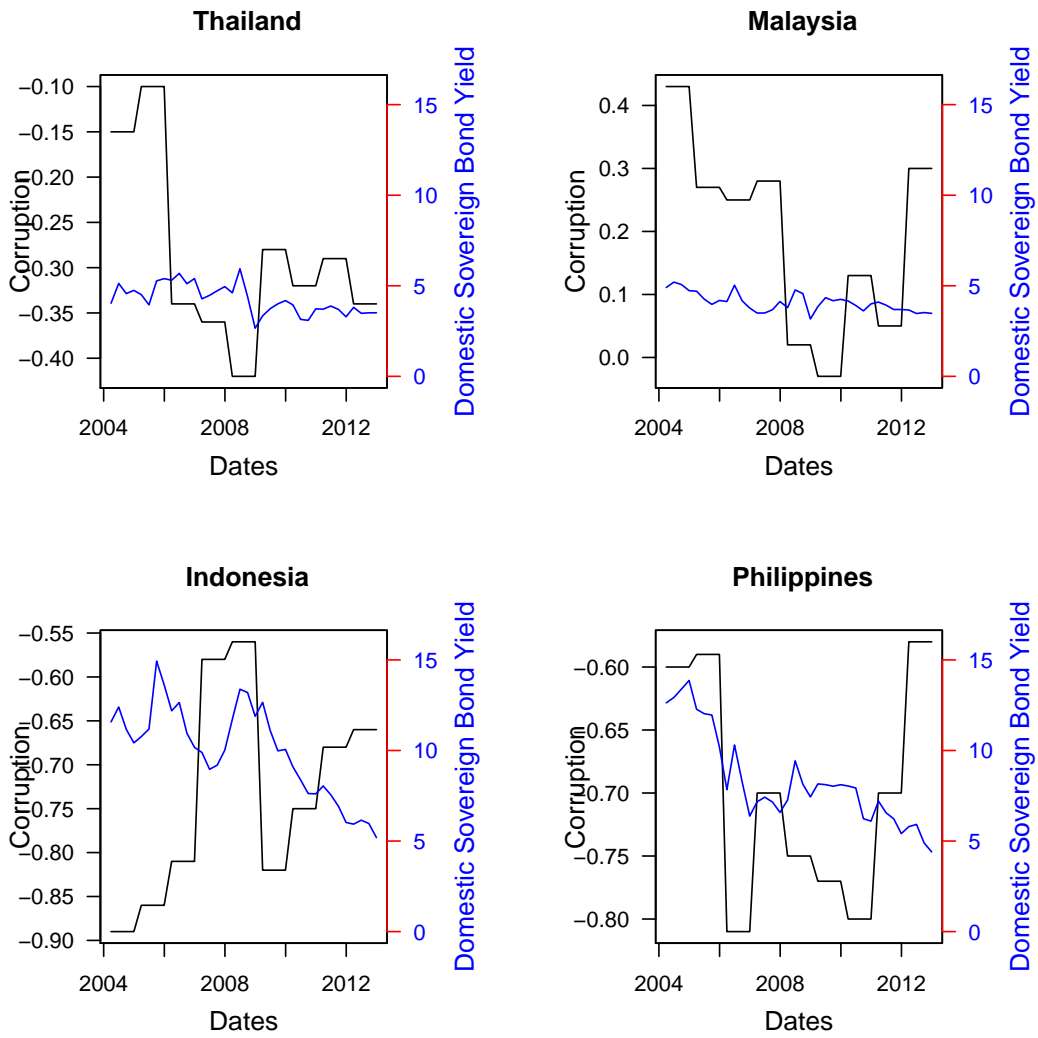


Figure B21: The First Principal Component for Political & Governance Variables

