Federal Reserve Bank of New York
Staff Reports

Estimating the Impacts of U.S. LSAPs on Emerging Market Economies' Local Currency Bond Markets

Jeffrey Moore
Sunwoo Nam
Myeongguk Suh
Alexander Tepper

Staff Report No. 595
January 2013

Estimating the Impacts of U.S. LSAPs on Emerging Market Economies' Local Currency Bond Markets

Jeffrey Moore, Sunwoo Nam, Myeongguk Suh, and Alexander Tepper

Federal Reserve Bank of New York Staff Reports, no. 595
January 2013
JEL classification: E00, E50, G15, F30

Abstract

This paper examines whether large-scale asset purchases (LSAPs) by the Federal Reserve influenced capital flows out of the United States and into emerging market economies (EMEs) and also analyzes the degree of pass-through from long-term U.S. government bond yields to long-term EME bond yields. Using panel data from a broad array of EMEs, our empirical estimates suggest that a 10-basis-point reduction in long-term U.S. Treasury yields results in a 0.4-percentage-point increase in the foreign ownership share of emerging market debt. This, in turn, is estimated to reduce government bond yields in EMEs by approximately 1.7 basis points. Federal Reserve LSAPs, which most previous studies have found reduced ten-year U.S. Treasury yields between 60 and 110 basis points during our sample period, therefore likely contributed to U.S. outflows into EMEs and marginal reductions in longer-term EME government bond yields. These effects are qualitatively similar to conventional U.S. monetary policy easing. To assess the robustness of these estimates, we also employ event study and vector autoregression methodologies, finding broadly similar results using these methods. While these results hold in the aggregate, marginal effects vary notably across emerging market countries.

Key words: monetary policy, large-scale asset purchases, international effects, capital flows, monetary transmission

---

Moore, Tepper: Federal Reserve Bank of New York (e-mail: jeffrey.moore@ny.frb.org, alexander.tepper@ny.frb.org). Nam, Suh: Bank of Korea (e-mail: nsw@bokor.kr, suhmg@bok.or.kr).

1. Introduction

The Federal Reserve began large scale asset purchases (LSAPs) in 2008. Similar to conventional monetary easing through reductions in the short-term policy rate, central bank asset purchases tend to reduce the yields of longer-dated bonds and other dollar-denominated assets. As such, the decline in longer-term Treasury yields attributable to large scale asset purchases may be one factor contributing to the movement of investment funds from the US into emerging market assets where higher risk-adjusted returns may be available. Such additional flows of funds into emerging market bonds may impact domestic monetary conditions by altering the relationship between domestic short-term rates and longer dated security yields. Further, some emerging market economies (EMEs) recently have experienced increases in foreign investment in conjunction with growth in both the liquidity and principal outstanding in their local currency government bond markets, potentially increasing the link between foreign and domestic interest rates via portfolio reallocations between developed and emerging bond markets. Together, these factors may loosen financial conditions associated with a given domestic policy rate, complicating EME policymakers' task in calibrating policy.

This paper seeks to quantify the degree to which Federal Reserve LSAPs influenced portfolio reallocations toward developing economy bonds and the influence of these flows on developing economy interest rates. The quantification of these spillovers may assist in the calibration of short-term interest rate policies in developing economies. To this end, we conduct an empirical study of the impact of changes in longer-term US Treasury yields and LSAP announcements on 10 EMEs for which data on foreign investment in their government bond markets are available.[1] Given separate estimates of the impact of US LSAPs on longer-term US yields, we can then infer the impact of US LSAPs on foreign investment and government bonds yields in EMEs.

This paper consists of five sections. Section 2 reviews the related academic literature. Section 3 briefly relates the stylized facts regarding foreign participation in local currency government bond

[1] Brazil, Hungary, Indonesia, Korea, Malaysia, Mexico, Peru, Poland, Thailand and Turkey

markets in the 10 EMEs considered in this study. Section 4 presents the empirical analysis and summarizes the major findings. Our conclusions are presented in Section 5.

2. Review of Related Literature

Most existing studies related to LSAPs in advanced countries analyze their implications and nature or their impacts on interest rates domestically or in other advanced economies.[2] There are few analyses of their impacts on capital flows into EMEs and on EMEs' interest rates.

Morgan (2011) investigated possible impacts of Federal Reserve LSAPs on Asian economies and financial markets and concluded that the LSAPs were unlikely to have a significant impact on financial markets, economic activity or inflation. It also investigated the impacts of the Federal Reserve's LSAPs on regional bond yields and exchange rates using event study analysis and argued that greatest impacts were a stronger Korean won and lower bond yields in Indonesia.

The IMF has conducted a few studies on the influence of interest rates in advanced countries on capital flows and interest rates in EMEs. First, in an analysis targeting 50 countries including 30 EMEs, the IMF (2011b) presented evidence that US monetary policy has a greater impact on net capital inflows in countries with higher financial exposures to the US, and that, by asset class, portfolio bond funds are more greatly influenced by US monetary policy than portfolio equity funds. By contrast, the IMF (2010) paper analyzed the impact of global liquidity on capital flows into 34 EMEs, finding that it had an impact on portfolio equity investment, but no significant influence on portfolio bond investment.[3] The IMF (2011a) also conducted an analysis of the sensitivity of capital flow volumes in 48 EMEs to a rise in the US 10-year Treasury bond yield. It concluded that a rise in the US interest rate would bring about declines in all types of capital flows into EMEs, and, in particular, that a 1 percentage point rise in the US

[2] We summarize recent studies which analyze the impacts of US LSAPs on domestic interest rates in Section 4.1.

[3] Some studies, meanwhile, have analyzed the direct impact of global liquidity on domestic interest rates and asset prices. Darius et al. (2010) analyzed the impact of global liquidity on asset prices, claiming that global liquidity had a significant impact on housing prices and only a limited impact on stock prices. In addition, Psalida et al. (2009) found that external factors including excess global liquidity were among the major factors determining stock prices in EMEs.

Treasury yield is associated with, on average, a 31 percent reduction in net bond inflows to EMEs. The IMF (2007) also found that a 1 percentage point rise of interest rate differentials was associated with a 0.1 percentage point rise in the ratio of capital inflows to EME GDP.

However, the studies mentioned above use the portfolio flow data from the International Financial Statistics (IFS) of the IMF, which include not only local currency bonds but also foreign currency ones. As such, these data may be inappropriate for analyzing how the US interest rates bring about changes in foreign investors' demand for particular local currency bonds, and consequently affect domestic interest rates in the country concerned. However, studies of foreign demand for such bonds are rather limited, owing to the shortage of available data. BIS (2007) analyzed the benefits and risks of local currency bond markets with respect to financial stability. It also explored the role of foreign investors in the development of local currency bond markets. In addition, using the Banque de France's survey about French investors, Daniel (2008) argued that the participation of foreign investors in EMEs' bond markets spurred the development of local currency bond markets. This development has increased the proportion of debt securities denominated in local currencies relative to those denominated in foreign currencies, reducing risk in these economies. In addition, Cho et al. (2010) show that in the case of Korea, deviations from covered interest parity are more important than G5 long-term interest rates in explaining the foreign holdings of won-denominated bonds.

Analyses related to the impact of foreign investment in EMEs' local currency bonds on domestic interest rates include the IMF (2011c) and Peiris (2010). Analyzing eight EMEs, the IMF concluded that a 1 percentage point increase in the share of foreign investors reduces long-term bond yields by about 5 basis points on average. Peiris (2010) conducted a similar analysis of ten EMEs and reached a similar conclusion: a 1 percentage point increase of the foreign share in government bond markets will tend to lower government bond yields by about 6 basis points on average. Our result of a 4 basis point reduction is roughly in line with these analyses.

3. Evolution of foreign investment in EMEs' government bond markets

Since the 2000s, EMEs have recognized the importance of local currency bond markets and promoted their development, especially government bond markets.[4] The size of government bond markets in the ten countries examined in this study grew about five-fold, from USD 445 billion at the end of 2000 to USD 2,197 billion at the end of 2010, as seen in Figure 1. Foreign participation in these markets increased eight-fold, from 2 percent at the end of 2000 to 16 percent at the end of 2010, driven by buoyant growth in the major EMEs, greater liquidity in their domestic bond markets, and lower growth prospects in developed countries.

In all these countries, with the exception of Poland and Hungary, foreign investors accounted for less than 5 percent in the government bond markets until the end of 2003. Since then, foreign holdings have risen to above 10 percent of the government bond markets in most of the countries and to over 30 percent in Indonesia and Peru. Since late 2008 when the financial crisis reached its peak and the first LSAP was implemented in the US, the proportion has increased by more than 10 percentage points in Malaysia, Indonesia, Peru and Poland while Korea, Mexico, Thailand and Brazil have witnessed around a 5 percentage point increase. Figure 2 shows the share of foreign investors in local currency government bond markets in each country along with domestic currency government bond yields.

4. Empirical Analysis

We aim to measure the impact of US LSAPs on capital flows into EME bond markets and on EME long-term interest rates. Empirical analysis is undertaken in four parts: as a preliminary matter, we examine correlations among our variables of interest; then, we review previous estimates of the impact of US LSAPs on the US 10-year Treasury yield; third, we examine the impact of the changes in long-term US interest rates on foreign investment into EMEs' local currency government bonds; and fourth, we

[4] Having experienced the currency crisis in the late 1990s, Asian countries realized the importance of developed capital markets in their own countries. For this reason, they made the development of government bond markets a high priority (ADB, 2001)(BIS, 2007).

estimate the impact of these changes in foreign investment on EMEs' local currency government yields.[5] In addition, we pursue three types of analysis that forego the intermediary capital flow step and assess the reaction of longer-term emerging market yields to changes in longer-term US Treasury yields directly. The first approach is to run a similar regression to the two stage approach but to estimate the direct pass-through from US yields to EME yields. The second approach is an event study similar to those performed on US Treasury yields alone. The last approach looks at the impact of identified shocks to US yields on EM yields within a vector autoregression framework.

4.1 Correlations among variables of interest

Before turning to an econometric analysis, we first examine the correlation among the main variables (see Table 1).

The correlation between the US 10-year Treasury bond rate and the proportion of foreign holdings in EME government bond markets is negative in most of the countries, though some show a positive correlation. This suggests that a decrease in longer-term US interest rates may be related to the expansion of foreign investment in many EMEs' government bond markets.

The correlation between foreign holdings in EMEs' government bond markets and the government bond rates in most of these nations is also negative. Compared with a situation when there are no foreign investors, yields should be lower as foreign investors' purchases push up the prices of government bonds. In Turkey, however, there is a highly positive correlation between the two, which was presumably attributable to the continuous upward trend in government bond yields from 2005 to 2008, unlike other nations. Besides this country, Peru, Brazil and Korea showed a slight positive correlation.

[5] Other pathways through which US monetary policy may influence EME financial conditions include the general re-pricing of risk and the shifting of global growth and inflation expectations. Here we focus on financial flows.

4.2 The impact of the US LSAPs on the US Treasury bond yields

The Federal Reserve has conducted two rounds of LSAPs.[6] During the initial LSAP (LSAP1), executed from December 2008 to March 2010, the Federal Reserve purchased $1.25 trillion of Agency mortgage-backed securities, $172 billion of Agency debt, and $300 billion of longer-term Treasury securities, totaling $1.722 trillion in face value or about $850 billion in ten-year equivalents.[7] During the second LSAP (LSAP2), conducted from November 2010 to June 2011, the Federal Reserve purchased $600 billion in longer-term Treasury securities, or about $400 billion in ten-year equivalents. Additionally, in August 2010, the Federal Open Market Committee (FOMC) announced that prepayments and maturing proceeds from LSAPs would be reinvested, in order to keep holdings of securities constant.

There have been a number of studies of the impact of the Federal Reserve's LSAP programs on US interest rates. Nearly all find an economically and statistically significant effect, although estimates vary widely. In our attempt to compare estimates, we assume that the impact of LSAPs on interest rates is linear in the size of the operation. This is likely not the case, but provides a useful benchmark.

Investigations fall into three broad categories. Event studies consider the change in yields in a specified time window around relevant Federal Reserve announcements. These have ranged from considering two-hour to two-day windows. Event studies have the advantage of offering clarity and simplicity, being able to include a significant number of events, and for shorter windows, being able to isolate the impact of the events considered. However, it can be difficult to identify the most salient events, and to choose the window so that it is wide enough to be certain of including the full market reaction but narrow enough to avoid confounding effects. Furthermore, the simple passage of a risk event such as an FOMC statement or a speech by the Federal Reserve Chairman can impact markets separately from the content of the statement or speech, and of course markets may also react to non-LSAP-related content in a

[6] The Federal Reserve subsequently executed a maturity extension program and undertook additional MBS and Treasury purchases, which are not encompassed by this paper.

[7] Ten-year equivalents is the par amount of 10-year US Treasury securities with equal dollar duration. See the following summary of Federal Reserve open market operations for additional detail on Federal Reserve LSAPs: http://www.newyorkfed.org/markets/omo/omo2010.pdf

statement or speech. Moreover, to the extent that LSAP expectations adjust in response to news outside the event window that directly affects yields, the event studies capture only the marginal impact of the announcements.

Another group of studies regresses various asset prices on measures of net bond supply and dummy variables for announcement days, as well as a number of fundamental control variables, These studies have the advantage of controlling for other factors and for avoiding reliance on short-term moves that may be attributable to idiosyncratic effects. However, they introduce error to the extent the model is incomplete or mis-specified, and many studies include a smaller set of events.

A third group formulates a structural model, which is then estimated or calibrated to financial and economic data in an attempt to mitigate some of the difficulties of the event study and simple regression approaches.

In a groundbreaking research paper, Gagnon et. al. (2010) find that the $1.722 trillion first round of LSAPs reduced the 10-year Treasury yield by 91 basis points in an event study and 58-82 basis points in a regression. They also estimate the effect on the Kim-Wright term premium (Kim and Wright, 2005), finding a 38-82 basis point impact.

Krishnamurthy and Vissing-Jorgensen (2011), evaluate the effects of LSAP1 and LSAP2 on different interest rates and asset prices using an event-study methodology incorporating daily and intra-day data. They find that LSAP1 reduced 10-year Treasury yields by 107 basis points and LSAP2 reduced 10-year Treasury yields by 40 basis points using a two-day event window and 14 basis points using a one-day event window. Using a statistical approach, the authors conclude that an increase in the safety premium due to a reduction in the supply of Treasury securities was particularly important.

Hamilton and Wu (2011) estimate an affine term structure model and find that a program entailing the purchase of $400 billion of the longest duration Treasury debt available would have reduced 10-year Treasury yields by 13 basis points in a zero-lower-bound environment. They also estimate a program that approximates the second LSAP, which appears to have an effect of approximately 11 basis

points on 10-year yields.

Glick and Leduc (2011) use an event study approach with one-day time windows and find that the first LSAP lowered 10-year Treasury yields by 100 basis points while the second LSAP had virtually no impact. Impacts on other developed-country yields, with the exception of Japan, were approximately 40-60 percent as strong.

Neely (2011) analyzes the effects of LSAP1 with a focus on spillovers to foreign asset prices. He finds that ten-year Treasury yields fell 118 basis points over the entire event sample, while foreign developed-country bond yields fell between 45 and 70 basis points, with the exception of Japan.[8]

Wright (2011) conducts an event study based on a VAR regression that is used to identify monetary policy surprises. His estimates imply a 115 basis point reduction in ten-year Treasury yields for the first LSAP based on Gagnon et. al.'s event dates, with a 13 basis point decline from the second LSAP assuming a linear relationship between purchases and interest rate changes. Wright finds an impact on Canadian, UK, and German yields that is 30-50 percent as large.

D'Amico and King (2010) use a CUSIP-level regression and find that the $300 billion of Treasury purchases in LSAP1 decreased 10-15 year Treasury yields by up to 50 basis points. However, they find that the effect in the 30-year sector of the yield curve was confined to the specific securities purchased and the general level of yields was not affected.

Doh (2010) estimates that the March 17, 2009 expansion of the first LSAP announcement reduced 10-year Treasury yields by 39 basis points; however, this likely understates the impact as the announcement was to some extent expected.

Previous estimates of LSAP impacts on the US 10-year Treasury yield are plotted in Figure 3. The median impact for the first LSAP is approximately 12 basis points per $100 billion in ten-year equivalents, or 100 basis points for the program. The median estimate for the second LSAP is smaller: 3.5 basis points per $100 billion in ten-year equivalents or 13 basis points for the program.

[8] Neely's foreign bond sample covers Australia, Canada, Germany, Japan, and the UK.

4.3 The impact of the US Treasury yield on foreign investment in EME bond markets

In the first regression of our two-stage approach, we regress the share of foreign investors' holdings in 10 EME bond markets on 10-year US Treasury yields. The 10 EMEs are Brazil, Hungary, Indonesia, Korea, Malaysia, Mexico, Peru, Poland, Thailand and Turkey. We include both yield-related variables as well as risk factors as controls.

Among yield-related variables, the domestic bond yield is clearly important. We also include expected currency appreciation, which we proxy by realized currency appreciation as instrumented by lagged currency appreciation. This is essentially equivalent to assuming an adaptive element to expectations formation. Finally, we include deviations from covered interest rate parity (CIP), measured as the one-year interest rate differential minus the one-year FX swap-implied rate differential, which may encourage foreign investors to engage in arbitrage activity by swapping out of their local currency into an EM currency and buying EM bonds

Besides yield-related factors, risk factors also impact foreign investors' willingness to invest in EM bonds. The risk factors can be categorized into global and country-specific risks. We use the US VIX to proxy for the former and countries' CDS spreads to proxy for the latter. The government bond market size is included to control for liquidity risk.[9] As a high economic growth rate may reduce perceived sovereign risk, GDP growth is also included. Lastly, inclusion in a global bond index may attract foreign investment, so inclusion in the WGBI and the AMI indexes are set as dummy variables.[10]

In accordance with the discussion above, we set the panel regression equation as follows:

$$Y_{it} = \alpha + \beta_1 UI_{it} + \beta_2 EI_{it} + \beta_3 EC_{it} + \beta_4 ARB_{it} + \beta_5 VIX_{it} + \beta_6 CDS_{it} + \beta_7 VOL_{it} + \beta_8 GDP_{it} + \beta_9 D1_{it} + \beta_{10} D2_{it} + \delta_i + \varepsilon_{it}$$

[9] Amount outstanding of government bonds in US dollars.

[10] Cho et al. (2010) used the inclusion in the WGBI (Citigroup's World Government Bond Index) and the AMI (Citigroup's Additional Market Indexes) as explanatory variables.

Where:

Y_t: foreign shares in government bond markets

Yield-related factors	Risk factors
UI_t: US 10-year Treasury yield	VIX_t: US VIX indexes
EI_t: EMEs government bond yields	CDS_t: CDS premiums
EC_t: currency appreciation	VOL_t: first difference of government bond markets' volumes
ARB_t: arbitrage opportunities	GDP_t: GDP growth rates
	$D1_t$: dummies for WGBI
	$D2_t$: dummies for AMI

Considering the high persistence of the dependent variable, we also estimated the model including a one-period lagged dependent variable as an independent variable. Quarterly data from 2004 to 2010 are used, considering that data of foreign share in government bond markets[11], government bond yields[12] and some explanatory variables in some EMEs are available from 2004. Apart from the panel analysis, we conduct a separate analysis on Korea using monthly data in order to compare Korea's result with other EMEs.

Ownership data on local currency government bonds of the countries are provided by Asian Bond Online for Asian countries and each country's central bank or government for remainder of the countries in the sample. US and EME government bond yields are provided by Bloomberg. For countries where the Bloomberg data is unavailable, the IMF's IFS data or the data on the central bank's webpage are used. A detailed list of data sources for this report is presented in Appendix 1.

The expected signs on the regression coefficients are negative (-) for β_1, β_5, β_6 and positive (+) for, β_2, β_3, β_4, β_7, β_8, β_9, β_{10}.

[11] For Thailand, Indonesia, Peru, Turkey and Brazil, data on the share of foreign investors in government bond markets are available from early 2003, late 2003, early 2005, late 2003 and early 2007, respectively.
[12] Data on government bond yields prior to 2004 are not available for Turkey, Indonesia and Peru.

Many of the data series display high persistence, so we conduct panel data unit root tests, with results shown in Annex 2. Considering the low power of the unit root test, short time-span of data and long-term information loss of difference variables, we use level variables except when we could not reject the null hypothesis of having a unit root in all panel unit root tests, in which case first differences are used for the analysis. This was the case only for bond market size.

Several explanatory variables, including EMEs government bond yields, may be endogenous. For example, the increase in foreign ownership share of a government bond market may cause a decrease of EMEs' government yields and may impact FX volatility, arbitrage opportunities, and the CDS spread. To further mitigate the possibility of endogeneity between the explanatory and dependent variables and the possibility of autocorrelation, Generalized Method of Moments (GMM) is used rather than OLS.[13] As moment restriction conditions, current and lagged variables are used for instrumental variables, with current variables used for the presumed exogenous variables and one and/or two-time lagged variables for presumed endogenous variables.[14] Considering the difference of the size of economies and economic conditions across the ten countries, we use fixed effects across countries.[15]

We also subdivide the 10 countries in accordance with certain characteristics and compare their coefficients among the different country groups.[16] First, we categorize the 10 EMEs into two groups in accordance with their FX rate regimes based on the classifications of Ilzetzki. et al. (2008). In general, as changes in the FX rate largely absorb external shocks under a free-floating exchange rate regime, the effects of modest external shocks on domestic economies are likely to be small. As a result, the countries

[13] Ogaki, M., 1999. GMM Estimation Techniques. Ch.2 in Generalized Method of Moments Estimation (Edited by Laszlo Matyas)

[14] Presumed endogenous variables are EMEs Treasury bond yields, currency appreciation, arbitrage opportunities, CDS spread, government bond market size, GDP growth rate and dummy variables. Presumed exogenous variables are the US 10-yr Treasury bond yield and the VIX index.

[15] Although we cannot report a Hausman test to justify fixed effects due to the lack of the number of cross-section compared to the number of independent variables, we believe fixed effect analysis is appropriate for the sample countries.

[16] We followed the methodology of the IMF (2011b), which argued that the higher the economic linkage with the US, the more flexible the exchange rate system, and the higher the degree of financial openness, the larger the changes of capital inflows stemming from US interest rate changes. That paper used total inflows including foreign currency-denominated securities as the dependent variable, however, while we consider only local currency-denominated bonds.

with fully flexible FX rate regimes, of which Turkey is the only example in our sample, are likely to be less impacted by US interest rate changes. By contrast, government bond yields in countries with fixed or managed floating rate regimes may be relatively more influenced by US rates, because under such regimes increased capital flows may result in one-sided FX rate expectations.

We apply financial openness as the second differentiating characteristic. In countries where the degree of financial openness is low, we expect changes in the US interest rates to have a smaller impact on the share of foreign investors in the government bond markets, while in countries with high levels of financial openness, the impact may be relatively large. The indexes of Chinn and Ito (2009) are used to indicate levels of financial openness.

The degree of financial linkage between individual EMEs and the US is used as a third differentiating characteristic. We categorize countries into groups according to their proportion of US-related external assets and liabilities in their total external assets and liabilities. We also examine countries according to their ratio of US-related external assets and liabilities to GDP.

The results of the analysis are shown in Table 2.[17] We estimate that a 1 percentage point drop in the US 10-year Treasury bond yield leads on average to a 4.2 percentage point increase in the percentage of foreign holdings of EME government bonds. This is statistically significant at the 1 percent level.[18] Of the control variables, the EMEs' government bond yield, CDS spread, government bond market size, economic growth rate and inclusion in the AMI index all have the expected sign and are significant at the 5 percent level. By contrast, a 1 percentage point rise in EMEs' government bond yield has a smaller effect, resulting in an estimated 2.0 percentage point increase of the foreign share in government bond markets. The reason why the decline in the US interest rate has a greater impact on the foreign investment

[17] The model is shown to be stable, as restrictions for over-identification are valid according to the p-values of the J-test. Even if we change some of the instrumental variables, the coefficients do not change materially. The model explains around 70% of the variance of foreign investment in EMEs' government bonds.

[18] Considering the high persistence of the dependent variable, we also estimated the model including a one-period lagged dependent variable as an independent variable. The coefficient of one-period lagged dependent variable is 0.78 and highly significant (t-value is 15.8). Under this specification, the coefficient (-2.17) of US interest rate maintains its significance (t-value is -5.65). With the lagged dependent variable, the long run effect is -9.9.

than an increase in the domestic interest rate does may be because variations in US interest rates not only result in changes in the interest rate differentials but also reflect global liquidity conditions and risk aversion. A 100 basis point increase in the CDS spread leads to a 5.2 percentage point decrease in the share of foreign government holdings. At the same time, a 1 percentage point increase in the economic growth rate in a country pushes the foreign share in its government bond market up by 0.33 percentage point, suggesting that foreign investors considered countries showing high growth as relatively more attractive investment opportunities on a risk adjusted basis.[19] For government bond market size, a $1 billion quarter-on-quarter increase leads to a 0.22 percentage point rise of the foreign ownership share. The inclusion of countries' government bonds in the AMI global bond index is associated with an increase in the share of foreign investment of 7.8 percentage points, with a somewhat smaller effect for the WGBI.[20]

The realized rate of currency appreciation is statistically significant only at the 10 percent level and has a different sign than assumed, with a one percentage point currency appreciation associated with a 0.53 percentage point decline in the foreign ownership share. The coefficients on variables capturing deviations from covered interest parity and the VIX are not significant.[21] When countries are categorized by the flexibility of their FX rate regimes, those with more flexible regimes are more affected by the US interest rate declines than those with rigid ones, but the difference is not statistically significant.[22],[23]

---

[19] We also applied a relative growth rate (World GDP growth less each EMEs' GDP growth) instead of absolute growth rate, but the coefficient was found to be similar (0.27) and significant (t-value is 1.79) at 10% confidence level.

[20] As of the end of 2010, Indonesia (from 2008 3Q), Korea (from 2006 3Q), Malaysia (from 2006 3Q), Mexico (from 2008 2Q), Poland (from 2004 1Q) and Thailand (from 2008 3Q) are in the AMI global bond index and Malaysia (from 2007 3Q), Mexico (from 2010 4Q) and Poland (from 2004 1Q) are in the WGBI.

[21] Considering the unit root possibility of some variables, such as foreign participation, US interest rate, EMEs interest rate, VIX and volume of bond market, we also estimated the regression using differenced variables. In this regression only US interest rate and currency appreciation keep their significance at 5% confidence level.

[22] Using the classification in Ilzetzki et al. (2008), one free floating (Turkey) and four managed floating countries (Brazil, Mexico, Poland and Indonesia) were labeled as flexible, and five crawling band countries (Hungary, Korea, Malaysia, Peru and Thailand) as rigid.

[23] The null hypothesis that coefficients for flexible and rigid countries are equal cannot be rejected at the 10% confidence level.

Looking at the grouping based on the Chinn and Ito Financial Openness Index[24], the US policy rate has more influence on the foreign investor shares in countries with higher openness than in those with lower openness, although the difference is not significant in this case either.

Lastly, we divide the countries in terms of their financial linkages with the US according to two different metrics. First, we classify countries into two groups using the method employed by the IMF (2011b): four countries (Peru, Korea, Brazil and Mexico) with more than 20% of their total external assets and liabilities in the US during 2004 to 2010; and six countries (Poland, Turkey, Hungary, Malaysia, Indonesia and Thailand) with less than 20%. We also classify countries into two groups by US-related external assets and liabilities as a proportion of GDP: five countries (Hungary, Mexico, Korea, Malaysia, Thailand) with more than 25% during 2004 to 2010 and five countries (Brazil, Peru, Indonesia, Poland and Turkey) with 25% or less.

In countries where a high proportion of total external assets and liabilities are in the US, as expected, foreigners' shares in the government bond markets are found to be more impacted by longer-term US interest rates (-5.0 percentage points) than in those with low exposure (-3.3 percentage points). However, when categorizing based on US-related external assets and liabilities relative to GDP, the result was the opposite: foreign bond ownership share in countries with low financial exposure to the US is more greatly affected (4.0 percentage point) by the US interest rate than those with high exposure (2.8 percentage points).

Analysis of the subsamples shows the impact of the US Treasury bond yield on foreign ownership share to be robust, with the estimated effect being a 3-5 percentage point increase in the foreign ownership share for each 1 percentage point decline in the 10-year US Treasury yield, with high

[24] This index is based on the binary dummy variables that codify the tabulation of restrictions on cross-border financial transactions reported in the IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions*. Four variables are used to calculate this index: 1) a variable indicating the presence of multiple exchange rates (*k1*), 2) a variable indicating restrictions on current account transactions (*k2*), 3) a variable indicating restrictions on capital account transactions (*k3*) and 4) a variable indicating the requirement of the surrender of export proceeds (*k4*). Indonesia, Mexico, Hungary and Peru, whose averages for the index were over 1.00 between 2004 and 2010, the period covered by this paper, were classified as highly open, while Poland, Malaysia, Brazil, Korea, Turkey and Thailand, whose averages were less than 0.50, were classified as less financially open.

statistical significance. The control variables show differing levels of significance, however, depending upon the grouping category. The differences of financial linkages to the US, financial openness and FX rate regime do not appear to have a clear influence on the pass-through of US interest rates on foreign holdings of EME domestic government debt.

A separate analysis of Korea using monthly data estimates that a 1 percentage point decline in the US 10-year Treasury yield results in a 5.2 percentage point increase in the foreign share of the Korean government bond market, a somewhat larger figure than that estimated in the panel regression. In addition, Korea's inclusion in the AMI in September 2006 is found to have encouraged foreign investors to increase their Korean bond market investment. Economic growth rates are found to be statistically significant, while other variables show low statistical significance.

4.4 The impact of foreign investment on EMEs government bond yields

In the second stage of our two-step approach, we analyze the impact of foreign investment on EMEs government bond yields. The dependent variable is the 10-year government bond yield of each nation.[25]

Long-term government bond yields and other long-term interest rates may be viewed as consisting of expected future short-term interest rates and a term premium. One of the most important factors affecting short-term and expected future short-term interest rates is the central bank policy rate. A policy rate hike works to increase long-term interest rates by raising the current short-term rate as well as expectations of future short-term rates. This is a typical transmission channel of monetary policy. Although the expected future policy rate could be added as an explanatory variable, information on policy expectations in EMEs is not typically readily available. As an alternative, inflation expectations and expectations of future economic growth are used. When inflation expectations are high or an economic upturn is expected, this will tend to increase long-term interest rates by boosting expectations of a future

[25] We used 2-year and 5-year Treasury bonds for Brazil and Turkey, respectively, as there is insufficient historical data for 10-year Treasury bond denominated in local currency.

rise in short-term interest rates assuming a country's monetary policy roughly follows a Taylor rule. Given the lack of information on expected inflation, however, we use the current year-on-year CPI growth rate as a proxy variable.

Next, we set the variables affecting the term premium. A country's CDS spread is one factor influencing the risk premium. The higher the CDS spread, the greater the implied default risk. We added the fiscal balance to GDP ratio as well, since a large fiscal deficit will increase risk due to the concerns about government solvency and push government bond yields up by increasing supply. Lastly, we include the foreign share in government bond markets.[26] Compared with the situation in which there is no foreign investment, we expect that foreign investors' participation will contribute to a decline in government bond yields by creating additional demand in the government bond market. Viewed alternatively, government bond holdings by foreign investors will reduce domestic tradable supply compared to the situation where foreign investment is absent. All variables are quarterly series ranging from 2004 through 2010.

Following the discussion above, we set the regression equation as follows:[27]

$$Y_{it} = \alpha + \beta_1 r_{it} + \beta_2 CPI_{it} + \beta_3 FI_{it} + \beta_4 FB_{it} + \beta_5 CDS_{it} + \beta_6 FR_{it} + \delta_i + \varepsilon_{it}$$

Y_t: government bond yields, r_t: policy rates, CPI_t: consumer price index (yoy)

FI_t: economic leading index, FB_t: fiscal balance to GDP, CDS_t: CDS spread

FR_t: foreign share in government bond markets, δ_i: country fixed effect

The expected signs are positive for β_1, β_2, $\beta_3$and β_5, and negative for β_4 and β_6. Unit root tests are

[26] In the IMF (2011c) analysis, in which eight countries' government bond yields are set as the dependent variables, the explanatory variables in addition to the foreign share in government bond markets are the policy rate, expected inflation, expected exchange rate fluctuations, economic growth and the CDS premium. These variables are adopted in this study as well, with the exception of expected currency appreciation since it is considered effective only through changes in foreign investment.

[27] As a robustness check, we also included an economic slack variable, but the coefficient was found to be small and not significant.

conducted in the same manner as mentioned above to determine whether level or first differences of variables should be used. To mitigate the effect of potential endogeneity between the explanatory and dependent variables and the possibility of autocorrelation, GMM is used. We use contemporaneous variables for the presumed exogenous variables and one- or two-period lagged variables as instrumental variables for assumed endogenous variables.[28] Similar to the first stage regression, fixed-effects are included since the economic conditions of the cross-section countries are all different. The Hausman-test statistics support the appropriateness of the fixed-effect model.

The separate analysis on Korea differs in two respects. First, monthly instead of quarterly data are used. Second, as an explanatory variable, the 1-year ahead expected CPI replaces CPI.

The results of the panel estimation are presented in Table 3.[29] Examining results for the full panel of countries, we estimate that a 1 percentage point increase of the foreign share in government bond markets leads to a 4 basis point decrease in EMEs' government bond yields on average, slightly lower than the figures in previous studies.[30] The domestic policy rate adjustment is also the most important and significant determinant for government bond yields: a 1 percentage point increase in the policy rate pulls government bond yields up by 62 basis points on average. This suggests that domestic monetary policy is still a critical factor in determining long-term interest rates. The analysis shows that the leading economic index and the CDS spread variables have the expected sign and are significant at the one percent level, and that the CDS spread variable has a particularly strong effect. However, the CPI and fiscal balance variables are insignificant or to show different signs than expected.

Next, we investigate how these results vary with government bond market size and degree of

[28] Presumed endogenous variables are CPI, economic leading indicator, CDS premium and foreign share. Presumed exogenous variables are the policy rate and fiscal balance.
[29] The model is shown to be stable, as restrictions for over-identification are valid according to the p-values of the J-test, and even if we change some of the instrumental variables, the coefficients do not change materially.
[30] A 6 basis points decrease in Peiris (2010) and a 5 basis points decrease in the IMF (2011c).

financial integration.[31] First, we find that a 1 percentage point rise of the foreign share of ownership in government bond market pulls government bond yields down by 6 basis points in countries with small government bond markets, while causing yields to drop by 3 basis points in countries with relatively large government bond markets. On the other hand, the impact on government bond yields of a 1 percentage point hike of the policy rate is 23 basis points higher in countries with large government bond markets than in those with small government bond markets.[32] This suggests that larger government bond markets are more affected by domestic monetary policy than by foreign participation.

In addition, a 1 percentage point increase of foreign participation in the government bond markets pulls government bond yields down by 5 basis points in countries with higher foreign participation and by 3 basis points in those where foreign participation is relatively low. We also find that the influence of the CDS spread and policy rate on the government bond yield is smaller in countries with higher foreign share.

In the case of Korea, overall results are similar to the full panel estimates. A 1 percentage point rise of the foreign share in government bond markets pushes government bond yields down by 3 basis points. A 1 percentage point hike in the policy interest rate pulls the 10-year government bond yield up by 55 basis points. The economic leading index and the CDS spread are also statistically significant at a 1 percent level, as in the panel regression. The 1-year ahead expected CPI of Korea is significant at the 1 percent level, although the CPI variable is not significant in the panel data.

We also apply the eight-year yield two years forward as the dependent variable instead of the 10-

[31] Countries are divided into two groups in accordance with their government bond market sizes: five countries with averages of $100 billion or more for the period of 2004-2010 (Brazil, Korea, Mexico, Poland and Turkey) and five with averages of $100 billion or less (Hungary, Indonesia, Malaysia, Peru and Thailand). Countries are also divided into two groups based on the share of foreign ownership on average for the period of 2004~2010: countries whose share exceeds 13% (Hungary, Poland, Peru, and Indonesia) and those with share lower than 13% (Brazil, Malaysia, Thailand, Mexico, Turkey and Korea).

[32] We also applied a market volume criterion to the regression specification in Section 4.2 but the coefficients of US interest rates were not statistically different between two groups.

year yield in the regression specification.[33] We consider this variable because short-term interest rates are generally thought of as being dominated by monetary policy expectations; thus any change in two-year interest rates could be viewed as reflecting a change in monetary policy expectations. Indeed, in light of the policies of many EMEs to attempt to limit currency appreciation by lowering short-term policy rates, it would not be surprising if US LSAPs led market participants to revise their expectations for EME monetary policy as well. We thus consider the eight-year yield two years forward as a dependent variable in order to control for expected changes in short-term rates.[34]

In this specification, foreign participation is also significant in explaining the eight-year yield two years forward.[35] This supports the view that the pass-through of LSAPs to EME bond yields is through a capital flow channel, rather than attributable to the expected reaction of EME central bank policy rates.

While we are primarily interested in the effect of US LSAPs on EME interest rates via a portfolio flows channel, we also examined the direct impact of US interest rate on EMEs interest rate within our panel regression framework. To accomplish this, we replaced the variable of foreign participation with the variable of US interest rate in the second regression. The coefficient on the 10-year US Treasury rate is 0.28 and marginally significant at the 10% level. However, adding back significant variables from the first regression (currency appreciation and inclusion in the bond index) causes the coefficient on the 10-year yield to change sign and become statistically insignificant. Thus the direct impact from US yields to EME yields is not robust to alternative specifications in our low frequency panel regression framework.

[33] Due to lack of historical data, we used the three-year two years forward for Turkey and the seven-year three years forwards for Hungary (10-yr and 3-yr) and excluded Brazil.
[34] We note that this is independent of the overall trend in policy expectations over the period, which differed across EMEs. Here, we are interested only the revision in those policy expectations in response to LSAPs.
[35] The coefficient of foreign participation was found to be slightly higher (-0.53) and significant (t-value is -3.3) at 1% confidence level.

4.5 Event Study Approach

To provide an alternative lens through which to view the impact of LSAPs on EME bond yields and further assess the results of the panel regression, we also conduct an event study of effect of the first and second US LSAPs on EME local currency bond yields and forward interest rates.

4.5.1 Data

We use data on US and EME bond yields from Bloomberg, and use the three LSAP I event days from Gagnon et. al. (2010) with large movements in US Treasury yields on announcements of planned increases in the Federal Reserve's asset holdings. We follow Glick and Leduc (2011) and Wright (2011) in choosing dates for the second LSAP. For the first LSAP, event dates are 11/25/08, 12/16/08, and 3/18/09. This is a more restrictive event set than most previous studies, but we are looking specifically for the pass-through from US to EM yields, rather than the absolute impact of a specific quantity of LSAPs on yields; the focus on these three dates allows us to focus on days when LSAP-related announcements were a predominant driver of price action and had large effects on US yields. While the results are not qualitatively different if more event days are included, statistical significance is reduced because the movements in EM yields are spread over more days. For the second LSAP, event dates were 8/10/10, 8/27/10, 9/21/10, 10/15/10, and 11/3/10.

Our study includes the Czech Republic, Hong Kong, Hungary, India, Indonesia, Malaysia, Mexico, Poland, Singapore, South Africa, South Korea, and Thailand. This sample of countries was chosen largely based upon data availability.

4.5.2 Methodology

We estimate the cumulative changes in each country's ten-year yield and eight-year yield two years forward on LSAP event days. [36]

For each LSAP event date, we consider the change in yield for each currency and tenor from the last close prior to the announcement to the first close after the announcement. When data are not available, the closest subsequent date for which data were available is chosen.

We use two approaches to calculate statistical significance. First, we assume that changes in bond yields follow a two-tailed exponential distribution, which has a higher, narrower peak and fatter tails than a normal distribution. This decision is empirically motivated, as historical yield movements seemed clearly to fit such a distribution. Figure 4 shows the distribution of daily movements for India's 10-year yield since September 2008 on a logarithmic scale: the virtually linear arrangement of the points suggests that a two-tailed exponential distribution is the best fit. In order to obtain a finding of statistical significance, we assume that daily moves are independent, and that the probability distribution for the total yield movement on any *n* days chosen at random is also a two-tailed exponential distribution with standard deviation equal to $\sqrt{n}$ times the standard deviation of the single day distribution.[37] As a second approach to statistical significance, we conduct Monte Carlo simulations to construct a sample distribution of three-day (not necessarily consecutive) total yield moves. We then compare the actual yield movements on the three LSAP I event days with the sample distribution to obtain a p-value.

4.5.3 Results and Discussion

The results of the event study for the first LSAP are shown in Table 4 below. For 11 of the 12 countries studied, 10-year yields declined on LSAP event days. On these dates, US 10-year yields fell 95

[36] In the case of Hungary, Malaysia and the Czech Republic, where we used the seven-year yield three-years forward due to data limitations.

[37] We also tried calculating this using a 2-day standard deviation of moves for two-day windows, but the results were virtually identical.

basis points, and the US Treasury 2y8y forward rate declined 110 basis points. Excluding the Indonesian and Hungarian outliers, 10-year yields in the EM countries studied declined an average of 31 basis points, while forward rates declined by 35 basis points, a pass through of about 32 percent.

The declines in the 10-year yield and forward interest rate are statistically significant at the five percent level in 10 of the 12 countries studied, and are significant at the one percent level in several countries. Statistical significance was generally consistent across the two calculation methods.

As robustness checks, we also perform the event study with a number of other potential event windows and window sizes. These include using two-day windows as well as one-day windows, adding Chairman Bernanke's speech on December 1, 2008 in which he indicated that the Fed could buy Treasury securities, and considering the full set of eight baseline events from Gagnon et. al. (2010). In no case does this appreciably change the results, although including all eight event days from Gagnon et. al. markedly reduces the significance of the results by increasing the threshold yield moves required for a finding of significance.

Consistent with previous literature, we find that the effects of the second LSAP were considerably smaller. While US ten-year yields declined by a total of 34 basis points on the two days following LSAP announcements, all of the moves came on the second day of the windows. The 2y8y forward interest rate declined 40 basis points in event windows, but again, this occurred entirely on the second day of the windows. In terms of 10-year equivalents, the second LSAP was approximately half the size of the first, but the impact on yields was more than proportionately smaller.

Given this muted effect on the US yield curve, it is unsurprising that there is no detectable effect on EME yield curves. Using two-day windows, and again excluding Indonesia and Hungary, where yields rose markedly, 10-year yields declined by an average of ten basis points, with declines occurring in seven of 12 countries for which data are available. The forward rate declined by an average of eight basis points, with declines occurring in six of 11 countries. This suggests a pass through of approximately 20-30 percent from US yields to EM yields. Using one-day windows, ten-year yields declined by an average of

four basis points and the forward rate declined by an average of one basis point. None of these figures were statistically significant.

In light of the lack of a clear, measurable impact of LSAP2 on even US yields, we do not include tables of event study results here.

In sum, these results suggest that the first LSAP did have a moderate pass-through to EME bond yields and forward rates of about 30 percent.[38] That the pass-through was equally as strong in the forward rates suggests that the portfolio balance channel from the LSAP, rather than the endogenous response of EME monetary policy expectations, was primarily responsible for the decline in EME yields.

In the case of the second LSAP, we find that the effect on both US and EME yields was smaller, consistent with previous literature. Additionally, the pass through from US to EME yields was somewhat smaller, depending on the specification, than in the first LSAP.[39]

4.6 Vector Autoregression Approach

As a compliment to the panel regressions and event study and to further assess the robustness of these findings, we estimate nonstructural vector autoregressions comprised of US 10-year Treasury yields and 10-year government bond yields of each of the emerging market economies noted above. We then examine the impulse response functions of EME bond yields to shocks to US yields.

4.6.1 Data

Data on 10-year government bond yields are acquired from Haver Analytics for the United States, South Korea, Brazil, Hungary, Malaysia, Thailand and Poland. Bloomberg provided data for the remainder of the countries in the sample (Turkey, India, Singapore, South Africa, Indonesia, Mexico,

[38] In Indonesia, the movement in yields was so large as to raise a significant question as to whether a US policy that lowered US yields by approximately 100 basis points could have plausibly lowered Indonesian yields by more than double this amount. If, indeed, there was another factor driving Indonesian yields, such a factor might also have driven yields in nearby Malaysia, another of the countries with a statistically significant drop in yields.

[39] Using two-day event windows, US 10-year yields declined by 34 basis points, while EME 10-year yields declined by an average of two basis points. Using one-day event windows, US 10-year yields actually rose by one basis point.

Hong Kong and the Czech Republic). These data are for domestically traded government bonds denominated in the currency of each EME. Our sample consists of daily data from July 2007 through November 2011.

4.6.2 Model and Estimation Results

We employ a nonstructural vector autoregression framework consisting of two time series: the US 10-year Treasury bond yield and an EME 10-year government bond yield. This same model is then estimated for each of the EMEs in our sample. Since the Bank of England and European Central Bank were also employing bond purchase programs over our sample period, we include Euro and Pound denominated 10-year yields as exogenous control variables in both equations of the VAR model.[40] All data are first differenced and five lags are used for US and EM country yields. Specifically, we estimate the following equations.

$$\Delta y_{(t)US} = \sum_{i=1}^{5} \beta_i \, \Delta y_{(t-i)US} + \sum_{i=1}^{5} \gamma_i \, \Delta y_{(t-i)EM} + \sum_{i=1}^{2} \delta_i \, \Delta y_{(t-i)UK} + \sum_{i=1}^{2} \theta_i \, \Delta y_{(t-i)Euro} + \varepsilon_t$$

$$\Delta y_{(t)EM} = \sum_{i=1}^{5} \beta_i \, \Delta y_{(t-i)US} + \sum_{i=1}^{5} \gamma_i \, \Delta y_{(t-i)EM} + \sum_{i=1}^{2} \delta_i \, \Delta y_{(t-i)UK} + \sum_{i=1}^{2} \theta_i \, \Delta y_{(t-i)Euro} + \varepsilon_t$$

The regression results are broadly in line with our earlier findings. Impulse response functions shown in Figure 5 indicate statistically significant reactions of 10-year EME bond yields to shocks to US 10-year bond yields in many of the EMEs in our sample. For these countries we observe a roughly 0.5 to 4 basis point decline for a 7.5 basis point downward shock to US 10-year yields (the size of the one standard deviation US rate shock used in constructing the impulse responses). This suggests a pass-through of US long-term rates to EM long-term rates in these countries of approximately 7 to 55 percent.

[40] Including Euro and Pound denominated 10-year government bond yields as endogenous variables does not materially impact the parameter estimates nor impulse response functions of interest.

This is broadly in line with the pass-through estimated using the panel regression and event study approach.

However, the VAR results suggest that the degree of pass through is quite country specific. Ten-year government bond yields in some countries, such as Hong Kong, show relatively large and statistically significant downward responses to unanticipated declines in US yields. By contrast, yield responses in other EMEs are either statistically insignificant or actually move in the opposite direction in response to US rate shocks (as in the case of Hungary). In general, the pass-through is larger in countries whose currency is fixed to or shadows the US dollar.

Importantly, the event study and VAR impulse responses show broadly consistent results across countries, with countries whose longer-term bond yields show statistically significant responses in the event study also typically having statistically significant impulse responses to US rates shocks in the VAR framework. Moreover, the order of magnitude of the pass-through from US Treasury yields to government bond yields in these emerging markets is also similar in both empirical approaches.

5. Conclusion

With the further development of local currency government bond markets in EMEs in recent years, foreign investment in these markets has also grown. In this environment, changes in US longer-term Treasury rates appear to have influenced foreign investment in EMEs' government bond markets and, in turn, longer-term government bond yields in many EMEs.[41]

Analysis of the impact of the US interest rates on foreign investment in EMEs' government bond markets and the impact of foreign ownership shares on government bond yields in the countries suggests that a 10 basis point decrease in the US 10-year Treasury yield pushes up the foreign share in government bond markets of the EM countries in our sample by an average of 0.4 percentage points, which in turn

[41] The first round of Federal Reserve LSAPs took place during a period of foreign withdrawals from EME government bonds markets. By lowering US yields, LSAPs may have attenuated this pullback from EMEs.

causes their government bond yields to fall by roughly 1.7 basis points. It is therefore estimated that the 100 and 13 basis point decreases in the 10-year US Treasury yield attributable to LSAP1 and LSAP2, respectively, did cause foreign capital to flow into the countries and consequently lowered their government bond yields, by approximately 17 and 2 basis points, respectively.

However, these effects appear to vary depending upon the FX rate regime, degree of financial openness, financial linkage with the US, and the size of the government bond market in each country. In addition, the panel estimates are, in a few cases, not robust to alternative model specifications. Generally, differences in the FX rate regime and financial openness do not materially alter our panel regression estimates. The importance of financial linkages with the US in determining the magnitude of the effect varies according to how those financial linkages are measured. Furthermore, the countries with large government bond markets experienced only small declines in government bond yields due to the growth of foreign investment in bond markets. In the Korean case, it is estimated that a 100 basis points decrease in the US 10-year Treasury bond yield has driven the foreign ownership share up by 5 percentage points and the government bond yield down by about 15 basis points.

We estimate that US LSAPs increased portfolio flows into many emerging market economies. These increased investment flows may have furthered the development of local currency bond markets. On the other hand, negative effects on EMEs' government bond markets may arise from substantive outflows of foreign capital as monetary policy in developed economies normalize.

Figure 1. The Size of Government Bond Markets in the 10 EMEs

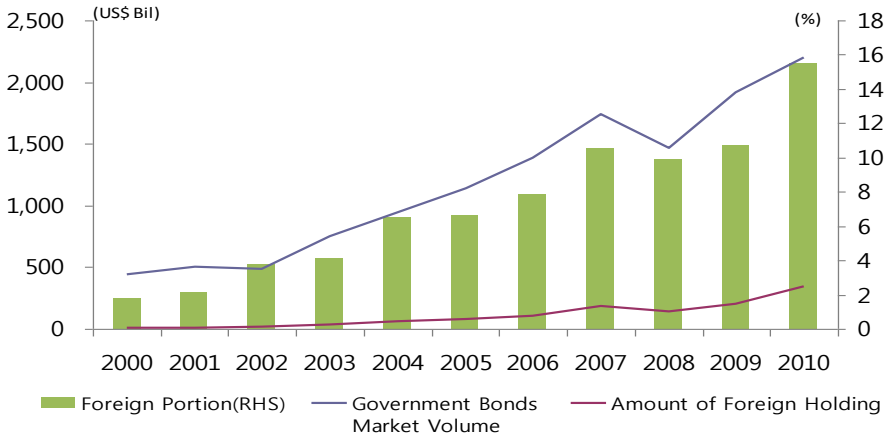
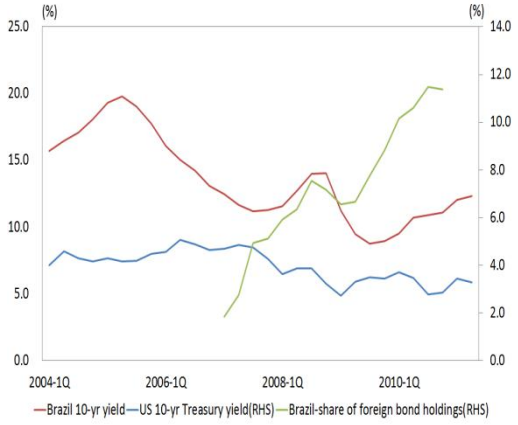
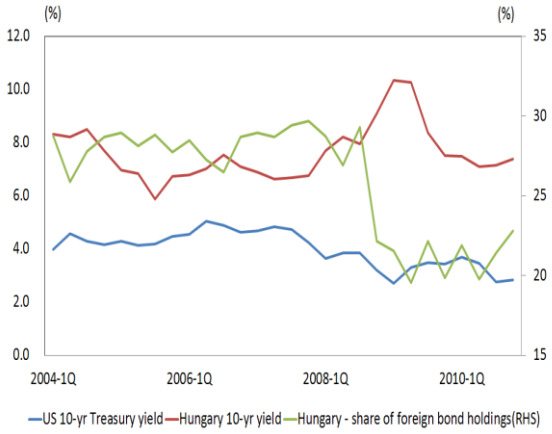


Figure 2. US Treasury yields, the 10 EMEs' Long-Term Yields and Foreign Share in Government Bond Markets

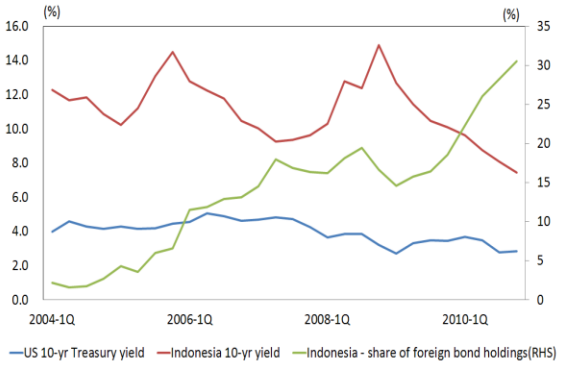
Brazil



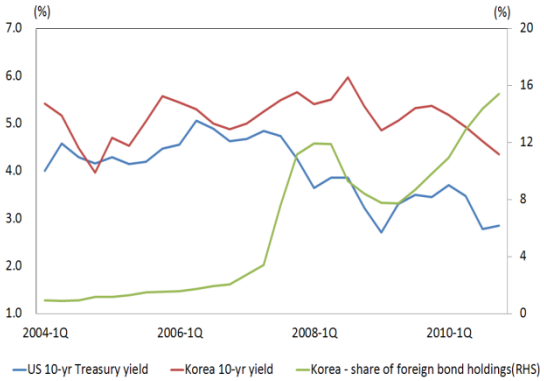
Hungary



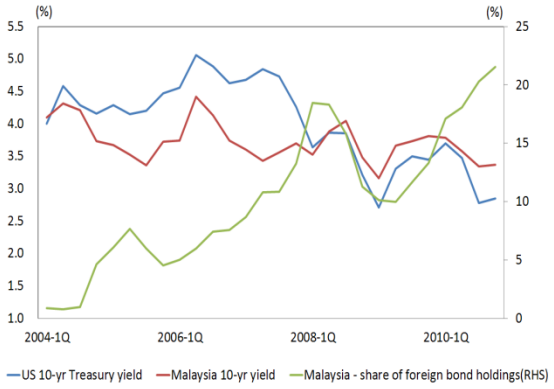
Indonesia



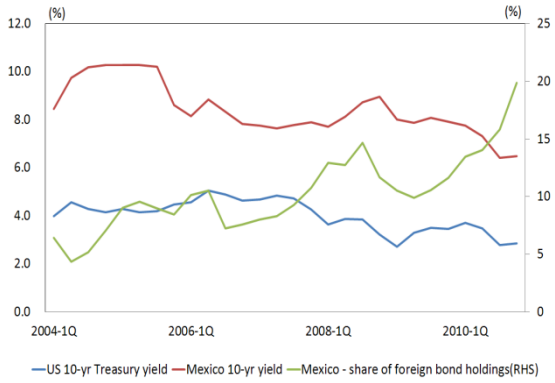
Korea



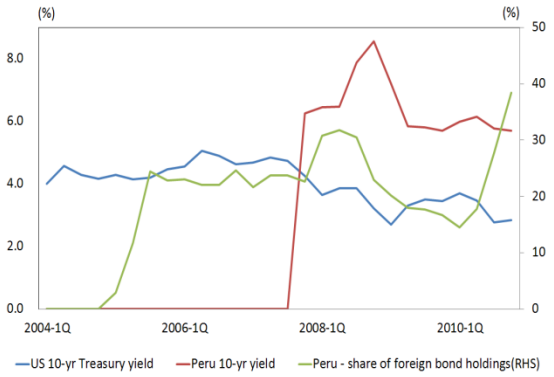
Malaysia



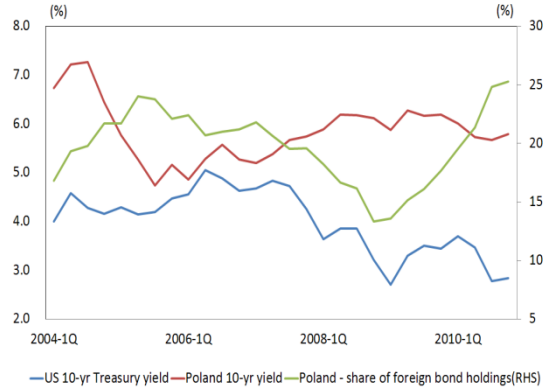
Mexico



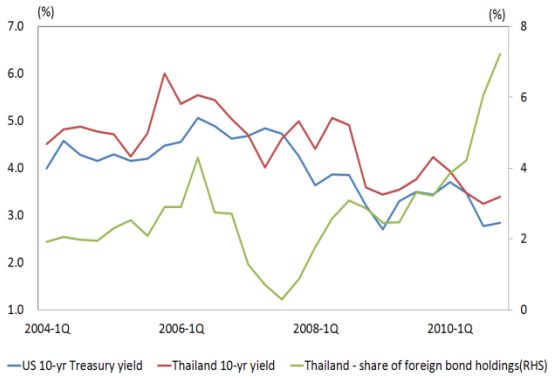
Peru



Poland



Thailand



Turkey

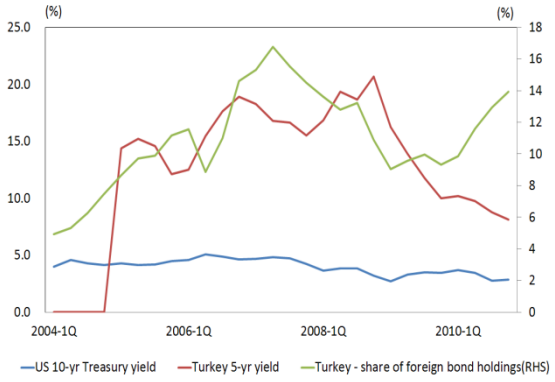


Figure 3: Estimated LSAP Impacts

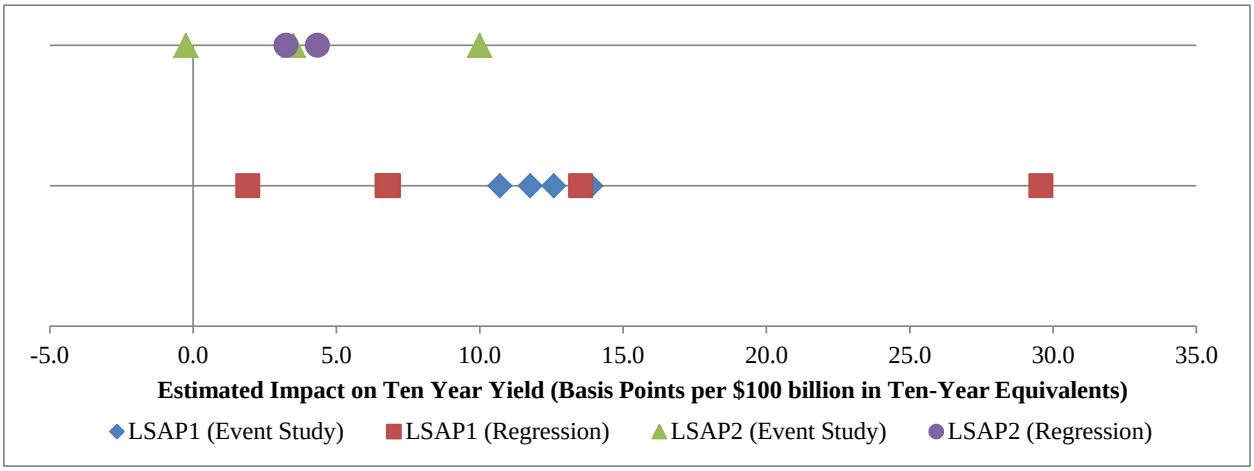


Figure 4: Frequency of Distribution of Daily Moves in Indian 10-Year Yield (2008-2011)

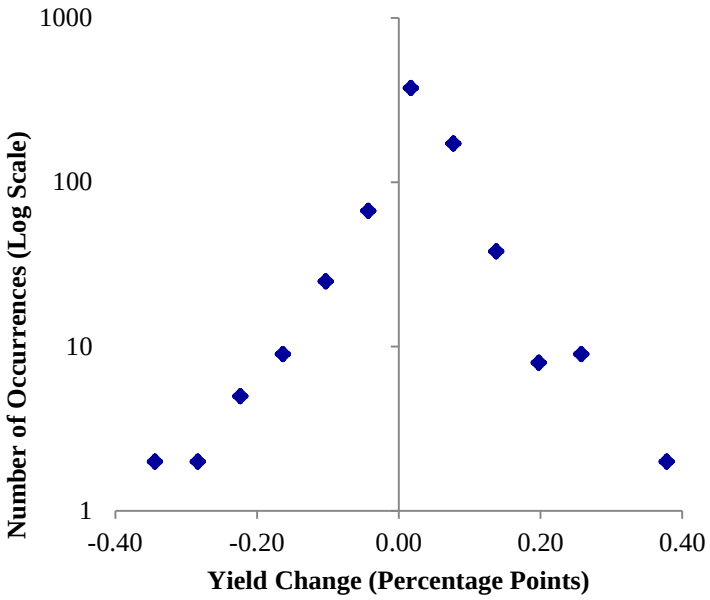


Figure 5: Impulse Response Functions

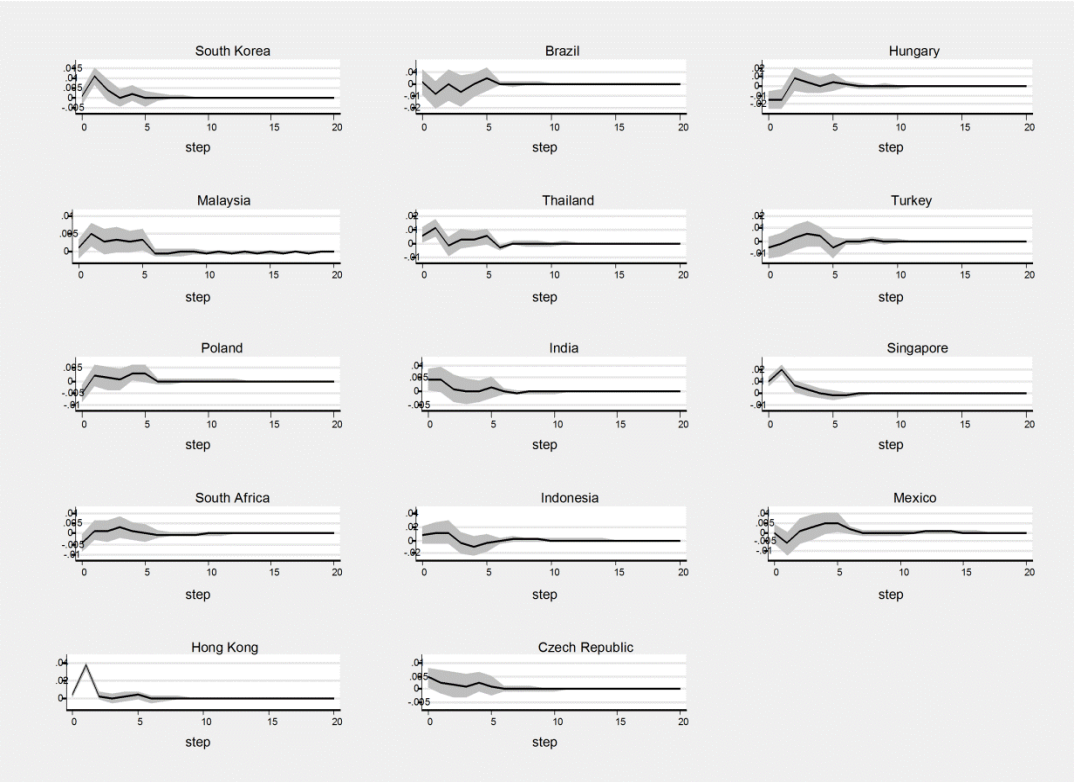


Table 1: The Correlation Coefficients between main variables (2004~2010)

	US rate[1] - Foreigner's share[2]	Foreigner's share[2] EME Government Bonds[3] yield
Brazil	-0.762	0.080
Hungary	0.742	-0.513
Indonesia	-0.532	-0.544
Korea	-0.726	0.151
Malaysia	-0.604	-0.557
Mexico	-0.661	-0.618
Peru	-0.160	0.133
Poland	0.297	-0.495
Thailand	-0.546	-0.370
Turkey	0.072	0.681

[1] US10-year Treasury yield
[2] Foreign share in government bond markets
[3] 10-year government bonds' yields except Brazil (2-year) and Turkey (5-year)

Table 2. Panel GMM Estimation for the Foreign Investment (2004~2010)

Impact on Foreign shares of GB markets	Total	FX flexibility		Financial Openness		Exposure to the US				Korea[1]
						% of External Assets and Liabilities)		% of GDP		
		Flexible	Rigid	Opened	Closed	High	Low	High	Low	
Constant	13.30*** (2.45)	20.34*** (2.92)	18.27*** (4.59)	14.17* (1.76)	13.35** (2.55)	11.93 (0.86)	18.41*** (4.93)	14.49*** (3.89)	14.50 (1.49)	21.43*** (3.75)
US 10-year Treasury yield	-4.20*** (-4.64)	-3.41*** (-3.96)	-2.84*** (-2.64)	-3.65** (-2.14)	-3.49*** (-4.64)	-5.04*** (-3.22)	-3.28*** (-4.72)	-2.76*** (-3.45)	-3.95*** (-2.65)	-5.14*** (-4.56)
EME interest rate	1.96*** (2.90)	0.87 (1.61)	0.47 (0.54)	1.82* (1.78)	1.19** (2.20)	2.01 (1.12)	0.92** (2.38)	0.77 (1.36)	1.93** (2.40)	0.10 (0.09)
Currency appreciation	-0.53* (-1.95)	-0.32 (-1.30)	0.03 (0.22)	-0.33 (-1.05)	-0.24 (-1.11)	-0.52 (-1.36)	-0.06 (-0.56)	-0.06 (-0.53)	-0.71* (-1.83)	-0.06 (-0.13)
Arbitrage opportunity	0.39 (1.01)	-0.18 (-0.57)	3.22*** (3.63)	1.48 (1.42)	0.14 (0.44)	0.84 (0.85)	-0.15 (-0.54)	0.96 (1.63)	0.38 (0.74)	0.65 (1.23)
VIX	0.07 (0.59)	0.12 (0.94)	0.05 (0.62)	0.31* (1.68)	-0.06 (-0.60)	-0.01 (-0.04)	0.16* (1.87)	0.14* (1.75)	0.00 (0.00)	0.09 (0.41)
CDS spread	-5.17*** (-4.28)	-5.72*** (-5.25)	-4.09*** (-3.00)	-5.90*** (-3.33)	-2.51 (-1.46)	-2.59 (-0.75)	-4.91** (-6.41)	-3.87*** (-3.55)	-6.03*** (-3.13)	-2.19 (-1.65)
First difference of government bond market size[2]	0.22** (2.10)	0.07 (1.02)	0.003 (0.04)	0.47* (1.73)	0.07 (1.02)	0.16* (1.71)	0.08 (0.68)	0.03 (0.35)	0.19** (1.99)	-0.05 (-0.17)
GDP growth rate	0.33** (1.98)	0.02 (0.10)	0.41*** (2.64)	0.56** (2.06)	0.22 (1.37)	0.34 (0.80)	0.28** (2.08)	0.27** (2.04)	0.18 (0.64)	0.41** (2.12)
D1	4.27* (1.93)	3.45 (0.97)	6.32*** (4.06)	0.22 (0.05)	5.83*** (3.84)	3.78 (0.64)	5.55*** (3.85)	5.26*** (3.97)	-	-
D2	7.82*** (4.58)	8.03*** (3.75)	3.13*** (2.79)	9.05*** (2.71)	5.93*** (5.31)	5.54** (2.60)	5.42*** (3.86)	4.65*** (5.72)	13.76*** (3.13)	4.32*** (3.73)
R-Square	0.70	0.72	0.93	0.77	0.82	0.64	0.89	0.93	0.40	0.81
DW Statistic	1.41	1.04	0.74	1.59	0.89	1.72	0.76	0.77	1.43	0.61
p-value of J-test	1.00	0.65	0.22	0.95	0.53	1.00	0.41	0.25	0.98	0.43
No. of observations	233	114	119	87	146	83	150	136	97	-

Note: ***, **, * denotes significance at the 1, 5, 10 percent levels. t-values are in the parenthesis

[1] From Jan 2004 to May 2011

[2] Due to the high possibility of having unit root, first difference is used for this analysis.

[3] For strongly presumed endogeneous variables (EME interest rate, currency appreciation and arbitrage opportunity), 2-time lagged variables are used for instrumental variables. And for weakly presumed endogeneous variables (CDS spread, first difference of government market size, GDP growth rate and dummies), 1-time lagged variables are used for instrumental variables.

Table 3. Panel GMM Estimation for the Government Bond Yields (2004~2010)

Impact on yields of GB	Total	GB Market size		Foreign Share		Korea[1]
		Big	Small	Big	Small	
Constant	3.67*** (10.58)	2.64*** (4.01)	4.67*** (11.64)	5.34*** (8.86)	2.98*** (6.55)	0.58 (1.31)
Policy rate	0.62*** (15.74)	0.66*** (12.30)	0.43*** (5.85)	0.43*** (4.36)	0.65*** (14.32)	0.55*** (9.36)
CPI	-0.03 (-0.80)	0.13 (0.90)	-0.004 (-0.09)	0.00 (0.01)	0.03 (0.39)	0.47*** (3.32)
Fiscal balance/GDP	0.02 (0.89)	0.07 (1.40)	0.003 (0.12)	-0.02 (-0.61)	0.03 (0.97)	-0.004 (-1.36)
Economic leading index	0.04*** (2.85)	0.08*** (3.34)	-0.002 (-0.10)	0.01 (0.41)	0.06** (2.33)	0.12*** (9.60)
CDS spread	0.56*** (6.50)	0.79*** (3.73)	0.36*** (4.40)	0.51*** (6.06)	0.58*** (3.12)	0.55*** (5.12)
Foreign share	-0.04*** (-2.77)	-0.03 (-0.91)	-0.06*** (-4.19)	-0.05** (-3.00)	-0.03 (-1.33)	-0.03*** (-3.29)
R-Square	0.95	0.95	0.95	0.94	0.96	0.74
DW Stat	0.77	0.80	0.83	0.93	0.73	1.43
p-value of J-test	0.98	1.00	0.90	0.98	0.94	0.38
No. of observations	235	118	117	85	150	-

Note: ***, **, * denotes significance at the 1, 5, 10 percent levels, t-values are in the parenthesis

[1] From Jan 2004 to May 2011. The expected changes in the policy rate for the following 4 to 7 months are included, and the coefficient and t-value of this variable are seen to be significant, registering 1.22 and 4.63, respectively.

[2] For strongly presumed endogeneous variables(CPI Economic leading index and foreign share), 2-time lagged varibles are used for instrumental variables. And for weakly presumed endogeneous variable(CDS spread), 1-time lagged varible is used for instrumental variable.

Table 4: Event Study Results for Three Event Days

	10y Rate Change	p-Value (Exponential)	p-Value (Monte Carlo)	2y8y Forward Rate Change	p-Value (Exponential)	p-Value (Monte Carlo)
Czech Republic	-0.11	11.3%	10.2%	-0.19*	5.8%	4.2%
Hong Kong	-0.49***	0.1%	0.0%	-0.51***	0.1%	0.3%
Hungary	0.34	89.9%	89.9%	0.51	93.5%	95.9%
India	-0.24**	4.4%	4.3%	-0.36***	0.4%	0.0%
Indonesia	-2.11***	0.1%	0.0%	-2.26***	0.1%	0.1%
Malaysia	-0.34***	0.1%	0.0%	-0.37**	1.7%	1.3%
Mexico	-0.37**	2.4%	1.6%	-0.41**	2.7%	1.9%
Poland	-0.24**	1.9%	1.4%	-0.25**	2.4%	1.8%
Singapore	-0.16**	3.5%	3.6%	-0.18**	3.6%	3.5%
South Africa	-0.41***	0.5%	0.0%	-0.38**	2.6%	1.2%
Korea	-0.25**	1.9%	1.5%	-0.28**	1.6%	1.2%
Thailand	-0.47***	0.1%	0.0%	-0.53***	0.2%	0.0%
Average	**-0.40**			**-0.43**		
Average Ex. Indonesia & Hungary	**-0.31**			**-0.35**		
US	-0.95			-1.10		
Pass through	32%			32%		

Table 5: LSAP 1 Daily 10y Results

	11/25/2008	p-value (Exponential)	p-value (Realized)	12/1/2008	p-value (Exponential)	p-value (Realized)	12/16/2008	p-value (Exponential)	p-value (Realized)	1/28/2009	p-value (Exponential)	p-value (Realized)	3/18/2009	p-value (Exponential)	p-value (Realized)
Czech Republic	0.00	52.2%	52.1%	-0.01	39.0%	34.7%	-0.10	5.6%	3.4%	0.00	46.7%	52.1%	-0.02	32.6%	24.6%
Hong Kong	-0.11	3.5%	2.5%	-0.03	27.2%	26.6%	-0.18	0.7%	0.7%	0.06	88.1%	89.3%	-0.19	0.6%	0.5%
Hungary	-0.16	13.6%	9.1%	0.01	53.9%	62.0%	-0.01	46.1%	44.7%	0.31	96.0%	95.9%	0.51	99.2%	99.1%
India	-0.09	10.6%	7.9%	-0.03	29.3%	23.8%	-0.15	3.8%	3.5%	0.16	96.8%	97.4%	0.00	46.7%	49.3%
Indonesia	-0.11	26.4%	12.2%	0.64	98.6%	98.8%	-1.47	0.0%	0.2%	-0.14	23.4%	8.4%	-0.52	2.8%	1.5%
Malaysia	-0.10	1.9%	0.9%	-0.07	5.1%	2.2%	-0.13	0.7%	0.7%	0.13	99.3%	99.4%	-0.11	1.4%	0.9%
Mexico	-0.15	6.0%	2.9%	-0.11	10.3%	4.4%	-0.12	9.0%	4.0%	0.10	88.8%	94.2%	-0.10	12.1%	5.7%
Poland	-0.17	1.0%	0.7%	0.02	69.5%	75.6%	-0.05	16.2%	10.4%	0.11	96.0%	97.4%	-0.02	27.8%	26.6%
Singapore	-0.04	17.6%	17.2%	0.04	86.1%	84.8%	-0.04	16.6%	45.2%	0.01	63.7%	90.5%	-0.08	4.3%	1.1%
South Africa	-0.12	4.5%	4.4%	-0.12	4.6%	4.4%	-0.27	0.3%	0.0%	-0.12	5.0%	4.4%	-0.02	34.4%	36.2%
Korea	-0.11	4.1%	4.5%	-0.13	2.6%	2.3%	0.00	50.0%	46.8%	0.06	87.3%	89.4%	-0.14	2.1%	1.9%
Thailand	0.02	68.5%	74.2%	-0.18	0.8%	0.9%	-0.25	0.2%	0.2%	0.07	89.6%	93.0%	-0.24	0.2%	0.5%
Average	**-0.09**			**0.00**			**-0.23**			**0.06**			**-0.08**		
Average Ex. Indonesia & Hungary	**-0.09**			**-0.06**			**-0.13**			**0.06**			**-0.09**		
USA	-0.22			-0.19			-0.26			0.14			-0.47		
Pass through	40%			32%			50%			42%			20%		

Table 5, Continued

	8/12/2009	p-value (Exponential)	p-value (Realized)	9/23/2009	p-value (Exponential)	p-value (Realized)	11/4/2009	p-value (Exponential)	p-value (Realized)
Czech Republic	0.01	63.5%	70.6%	-0.04	22.2%	13.7%	0.01	61.0%	70.6%
Hong Kong	0.01	60.5%	60.9%	-0.01	42.4%	41.7%	0.02	69.5%	69.1%
Hungary	-0.20	9.8%	6.6%	-0.09	24.0%	14.8%	-0.05	33.3%	26.3%
India	0.00	47.5%	49.3%	0.01	57.2%	59.6%	0.01	56.4%	59.6%
Indonesia	-0.10	29.5%	13.9%	-0.11	37.2%	6.3%	-0.01	48.1%	47.0%
Malaysia	-0.01	36.1%	22.5%	0.00	50.0%	51.5%	0.01	63.9%	82.8%
Mexico	0.04	70.2%	79.6%	-0.08	16.1%	8.2%	0.07	75.7%	89.9%
Poland	0.03	75.9%	82.1%	0.00	50.0%	48.6%	-0.01	44.5%	35.6%
Singapore	0.02	72.8%	80.3%	-0.02	24.2%	40.0%	0.01	63.7%	40.0%
South Africa									
Korea	0.03	74.8%	76.6%	-0.01	39.8%	38.8%	-0.01	39.8%	38.8%
Thailand	-0.02	34.5%	29.3%	-0.06	13.7%	9.3%	-0.03	25.0%	21.3%
Average	**-0.02**			**-0.04**			**0.00**		
Average Ex. Indonesia & Hungary	**0.01**			**-0.02**			**0.01**		
USA	0.05			-0.03			0.06		
Pass through	25%			87%			17%		

Table 6: LSAP 1 Daily Forward Rate Results

	11/25/2008	p-value (Exponential)	p-value (Realized)	12/1/2008	p-value (Exponential)	p-value (Realized)	12/16/2008	p-value (Exponential)	p-value (Realized)	1/28/2009	p-value (Exponential)	p-value (Realized)	3/18/2009	p-value (Exponential)	p-value (Realized)
Czech Republic	-0.06	15.8%	11.2%	0.01	61.3%	69.3%	-0.11	5.6%	3.2%	0.02	64.0%	71.8%	-0.02	33.6%	27.5%
Hong Kong	-0.12	4.6%	3.4%	-0.05	19.6%	20.4%	-0.18	1.2%	0.8%	0.08	89.4%	89.7%	-0.21	0.6%	0.2%
Hungary	-0.14	19.1%	14.5%	0.00	48.4%	44.0%	0.00	49.1%	54.4%	0.33	95.1%	96.0%	0.65	99.4%	99.6%
India	-0.15	1.5%	1.7%	-0.04	18.6%	5.1%	-0.19	0.6%	1.5%	0.20	99.5%	98.6%	-0.01	37.6%	2.7%
Indonesia	-0.02	46.4%	45.6%	0.81	98.9%	98.9%	-1.61	0.0%	0.2%	-0.05	39.3%	30.0%	-0.63	2.5%	1.6%
Malaysia	-0.14	5.3%	7.0%	-0.10	11.1%	12.9%	-0.14	5.6%	8.8%	0.14	94.4%	91.1%	-0.11	8.3%	10.5%
Mexico	-0.17	6.4%	2.7%	-0.12	12.2%	5.8%	-0.12	11.7%	5.2%	0.13	89.2%	95.4%	-0.12	10.8%	4.8%
Poland	-0.18	1.2%	0.8%	0.03	76.0%	82.0%	-0.05	17.3%	12.9%	0.13	96.6%	97.5%	-0.02	31.8%	26.4%
Singapore	-0.05	16.4%	16.8%	0.05	84.1%	84.2%	-0.04	19.4%	19.9%	0.02	66.3%	65.4%	-0.10	4.2%	3.5%
South Africa	-0.12	9.9%	11.8%	-0.10	12.7%	17.5%	-0.26	1.4%	0.0%	-0.14	7.4%	7.2%	0.00	52.3%	58.7%
Korea	-0.10	5.8%	6.3%	-0.12	3.6%	4.0%	0.01	55.1%	56.7%	0.07	88.9%	91.2%	-0.18	1.0%	1.0%
Thailand	0.02	65.5%	70.1%	-0.17	2.0%	2.2%	-0.25	0.5%	0.8%	0.08	87.9%	92.1%	-0.31	0.2%	0.5%
Average	-0.10			0.02			-0.25			0.08			-0.09		
Average Ex. Indonesia & Hungary	-0.11			-0.06			-0.13			0.07			-0.11		
USA	-0.26			-0.22			-0.30			0.15			-0.54		
Pass through	40%			28%			45%			47%			20%		

Table 6, Continued

	8/12/2009	p-value (Exponential)	p-value (Realized)	9/23/2009	p-value (Exponential)	p-value (Realized)	11/4/2009	p-value (Exponential)	p-value (Realized)
Czech Republic	0.04	77.3%	85.3%	-0.05	19.6%	14.2%	0.01	61.2%	69.0%
Hong Kong	0.00	53.8%	54.5%	0.00	48.1%	47.9%	0.03	72.5%	72.7%
Hungary	-0.20	12.5%	8.8%	-0.09	26.8%	17.3%	-0.04	36.6%	32.2%
India	-0.01	40.8%	27.8%	0.02	67.8%	64.8%	0.03	75.9%	84.2%
Indonesia	-0.08	34.1%	21.5%				0.00	49.4%	53.4%
Malaysia	-0.01	45.8%		0.00	53.3%		0.02	62.8%	
Mexico	0.03	64.4%	68.9%	-0.09	16.1%	8.7%			
Poland	0.01			0.00			0.00		
Singapore	0.03	73.2%	73.3%	-0.03	26.4%	28.0%	0.02	65.5%	64.8%
South Africa	0.00			0.00			0.00		
Korea	0.02	69.1%	72.7%	-0.01	42.6%	45.1%	0.00	47.5%	49.6%
Thailand	-0.01	39.2%		-0.07	14.1%	12.6%	-0.05	19.2%	18.0%
Average	**-0.01**			**-0.03**			**0.00**		
Average Ex. Indonesia & Hungary	**0.01**			**-0.02**			**0.01**		
USA	0.07			-0.04			0.08		
Pass through	16%			63%			7%		

Annex 1: Data Sources

Data	Source
Outstanding Amounts of Local Currency Government Bonds and Foreign holdings of Local Currency Government Bonds	Asian Bond Online, Each Central Banks and National Treasuries'webpage, IMF, AKK
GDP (Current Prices)	IFS (IMF)
Government Bonds' Yield Current Account/GDP Fiscal Deficit/GDP Policy rates GDP growth rate(YoY, QoQ) Arbitrage chance	Bloomberg, IFS(IMF), Central Banks and National Treasury
VIX, CDS spread, FX rates, CPI, CRS rate,	Bloomberg, Infomax
Korea's Monthly GDP growth rates Expected increase of policy rate in 6 months 1-year ahead expected CPI	The Bank of Korea
Economic Leading Index	OECD, The Bank of Korea, Other Central banks

Annex 2: Results of Unit Root Tests for Panel Data (2004~2010)

	Common unit root		Individual unit root		
	Levin, Lin & Chu t*	Breitung t-stat	Im, Pesaran and Shin W-stat	ADF - Fisher Chi-square	PP - Fisher Chi-square
US interest rate	-2.08** (0.02)	-1.43* (0.08)	0.63 (0.74)	8.98 (0.98)	16.58 (0.68)
Foreign share	1.34 (0.91)	-0.52 (0.30)	-1.07 (0.14)	28.96* (0.09)	11.09 (0.94)
EMEs interest rate	0.86 (0.81)	1.09 (0.86)	-1.77** (0.04)	30.41* (0.06)	17.94 (0.59)
Policy rate	-0.21 (0.42)	-3.63*** (0.00)	-1.74** (0.04)	28.06 (0.11)	10.40 (0.96)
Arbitrage opportunity	-3.16*** (0.00)	-	-	46.62*** (0.00)	41.31*** (0.00)
CDS spread	-3.03*** (0.00)	-	-	26.21 (0.16)	32.05** (0.04)
Economic Leading index	-5.65*** (0.00)	-	-	75.46*** (0.00)	63.20*** (0.00)
Government Bond market size	5.09 (1.00)	-	-	1.48 (1.00)	1.13 (1.00)
Fiscal balance/GDP	-0.92 (0.18)	-	-	37.71** (0.01)	75.45*** (0.00)
Currency appreciation	-12.52*** (0.00)	-	-	171.58*** (0.00)	139.04*** (0.00)
GDP growth rate	-2.58*** (0.00)	-	-	37.44** (0.01)	36.48** (0.01)
VIX	-2.19** (0.01)	-	-1.93** (0.03)	27.07 (0.13)	26.99 (0.14)
CPI	-0.92 (0.18)	-	-3.80*** (0.00)	49.79*** (0.00)	35.42** (0.02)

Note: ***, **, * denotes significance at the 1, 5, 10 percent levels. P-values are in parenthesis. Null hypothesis is there is unit root process in the panel data.

References

Bernanke, Ben, Bertaut, Carol, DeMarco, L. Pounder, Kamin, Steven 2011, "International Capital Flows and the Returns to Safe Assets in the United States, 2003-2007", Board of Governors of the Federal Reserve System, International Finance Discussion Papers Number 1014

BIS, 2007, "Financial stability and local currency bond markets", CGFS Papers No 28

Blinder, Alan S. 2010, "Quantitative Easing: Entrance and Exit Strategies", Federal Reserve Bank of St. Louis Review, Nov/Dec 2010, 92(6), pp. 465-79

Burger J. D. and F. E. Warnock, 2007, "Foreign Participation in Local-Currency Bond Markets", Review of Financial Economics, Vol. 16, pp. 291-304

Chinn, Menzie D and Hiro Ito, 2006, "What Matters for Financial Development? Capital Controls, Institutions, and Interactions",

Cho, Sukbang, Eunkyung Lee, Dongwoo Kim, 2010, "Analyzing Determinants of Foreign Portfolio Bond Investment in Korea " in Korean, The Bank of Korea's monthly bulletin, Sep 2010

————, 2008, "A New Measure of Financial Openness", Journal of Development Economics, Volume 81, Issue 1, Pages 163-192 (October)

————, 2009, " The Chinn-Ito Index" undated to 2009

Dairus, Reginald and Soren Radde 2010, "Can global liquidity forecast asset prices?", IMF working paper WP/10/196

D'Amico, Stefania and Thomas B. King, 2010, "Flow and Stock Effects of Large-Scale Treasury Purchases", FRB Finance and Economics Discussion Series 2010-52

Daniel, Laurent, 2008, "Foreign Investors' Participation in Emerging Market Economies' Domestic Bond Markets", Quarterly selection of Articles, Banque de France, pp. 61-77

Fullwier, Scott and L. Randall Wray, 2010, "Quantitative Easing and Proposals for Reform of Monetary Policy Operations" Levy Economics Institute Working Paper No. 645

Gagnon, Joseph, Matthew Raskin, Julie Remache and Brian Sack, 2010, "Large-Scale Asset Purchase by the Federal Reserve: Did They Work?", FRB NY Staff Reports no. 441

Glick, Reuven and Sylvain Leduc, 2011"Central Bank Announcements of Asset Purchases and the Impact on Global Financial and Commodity Markets"

Hamilton. James D. and Jing Cynthia Wu, 2011, "The Effectiveness of Alternative Monetary Policy Tools in a Zero Lower Bound Environment", NBER Working Paper 16956

Ilzetzki, Ethan, Carmen M. Reinhart and Kenneth S. Rogoff, 2008, "The Country Chronologies and Background Material to Exchange Rate Arrangements in 21st Century: Which Anchor Will Hold?"

IMF, 2007, "The quality of domestic financial markets and capital inflows" in Global Financial Stability Report

————, 2009, "Unconventional Choices for Unconventional Times:Credit and Quantitative Easing in Advanced economies" IMF Research and Monetary and Capital Market Departments

————, 2010, "Global Liquidity Expansion: Effects on Receiving Economies and Policy Response" Options in Global Financial Stability Report: Meeting New Challenges to Stability and Building a Safer System

————, 2011a, "Recent Experiences in Managing Capital Inflows-Cross-Cutting Themes and Possible Policy Framework"

————, 2011b, "International Capital flows: Reliable or Fickle?" in World Economic Outlook

————, 2011c, "Policy Responses to Capital Flows in emerging Markets" IMF Staff Discussion Note

Joyce, Michael, Ana Lasaosa, Ibrahim Stevens, and Matthew Tong 2010, "The financial market impact of quantitative easing", BOE Working paper No. 393

Kamin, Steven B., 2010, “Financial Gloablization and Monetary Policy” FRB International Finance Discussion Papers, Number 1002

Kaminsky, Graciela L., 2008, “Crisis and sudden stop: Evidence from international bond and syndicated-loan markets”, Institute for Monetary and Economic Studies, Bank of Japan Discussion Papers Number 2008-E010, 2008

Krishnamurthy, Arvind and Annette Vissing-Jorgensen, 2011, “The Effects of Quantitative Easing on Long-term Interest rates”, Working paper, Northwestern University

Neely, Christopher J., 2010, “The Large-Scale Asset Purchases Had Large International Effects”, FRB of St. Louis Working Paper 2010-018C

Morgan, Peter J., 2011, “Impact of US Quantitative Easing Policy on Emerging Asia”, ADBI Working Paper No. 321

Ogaki, M., 1999. “GMM Estimation Techniques”. Ch.2 in Generalized Method of Moments Estimation (Edited by Laszlo Matyas)

Peiris, Shananks J., 2010, “Foreign Participation in Emerging Markets' Local Currency Bond Markets” IMF Working Paper No. 10/88

Psalida, L. Effie and Tao Sun, 2009, “Spillovers to Emerging Equity Markets: An Econometric Assessment” IMF Working Paper

Rosa, Carlo, 2012, “How ‘Unconventional’ are Large-Scale Asset Purchases? The Impact of Monetary Policy on Asset Prices”, Federal Reserve Bank of New York Staff Reports, No 560

Taeyoung Doh, 2010, “The Efficacy of Large-Scale Asset Purchases at the Zero Lower Bound”, FRB of Kansas City Economic Review Second Quarter 2010 pp.5-34

Warnock, Frank, and Veronica Warnock, 2009, “International Capital Flows and US Interest Rates”, Journal of International Money and Finance, vol 28 (October) 903-19

Wright, Jonathan H., 2011, “What does Monetary Policy do to Long-Term Interest Rates at the Zero Lower Bound?”, NBER Working Paper 17154

Y. Kim (ed) ‘Government bond market development in Asia’, Asian Development Bank, 2001