Offshore EME bond issuance and the transmission channels of global liquidity*

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Abstract

The practice of using offshore affiliates as financing vehicles by emerging market corporates has become widespread since 2010. We investigate the extent to which offshore issuance has become a channel for the transmission of global financial conditions to emerging market economies. Using panel VAR methods, we find that offshore issuance has become more important than onshore issuance for the transmission of global liquidity after 2010. We also find that a significant role of offshore issuance is found in the countries with strengthed capital account restrictions, which may suggest that the strong role of offshore issuance in recen years is related to circumvention of capital controls.

Keywords: capital flows, global liquidity, cross-border spillovers, panel VAR, international debt securities, onshore vs. offshore

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1 Introduction

A recurring theme in global capital markets in recent years has been the surge in bond issuance by emerging market borrowers. Three issues have received particular attention in this context.

First, non-financial firms from emerging market economies (EMEs) have increased their presence in the bond market substantially in recent years, in contrast to the pre-crisis period when the banking sector played the dominant role in international capital markets. This shift from banks to non-banks have been discussed in a series of recent contributions, and present new challenges for the analysis of capital flows.[1]

Second, the bonds issued by EME non-bank borrowers in international capital markets have been mainly in US dollars. The importance of the US dollar as the currency of denomination of the bond issuance echoes the international role of the US dollar more generally. Updates of the figures reported in McCauley, McGuire, and Sushko (2015) put the total outstanding US dollar-denominated debt of non-banks located outside the US at US$9.7 trillion, of which approximately US$3.3 trillion are owed by non-banks from emerging market economies (EMEs).[2]

Third, and most relevant for our paper, a large part of the bond issuance by emerging market borrowers has been through their offshore affiliates, registered outside their home jurisdiction. Typically, discussions of capital flows begin with a definition of what constitutes external debt, where "external" is defined as a debt incurred by a resident borrower to a non-resident lender. The criterion for residence follows the balance of payments boundary. In this way, official data on capital flows are compiled on a locational basis, with the balance of payments boundary being the relevant border for what constitutes external or internal exposure.

However, the prevalence of offshore issuance activities by EME corporate borrowers means that the traditional boundaries may not be informative concerning underlying vulnerabilities. This is especially so when the offshore affiliates borrow by issuing bonds in international financial

[1] See, for instance, Caruana (2013, 2014), Shin (2013), Turner (2014), Feyen, et al (2015), Sobrun and Turner (2015) and Chui, Kuruc and Turner (2016).

[2] See also McCauley, Upper, and Villar (2013), which is an early reference for the role of the dollar in EME international bond issuance.

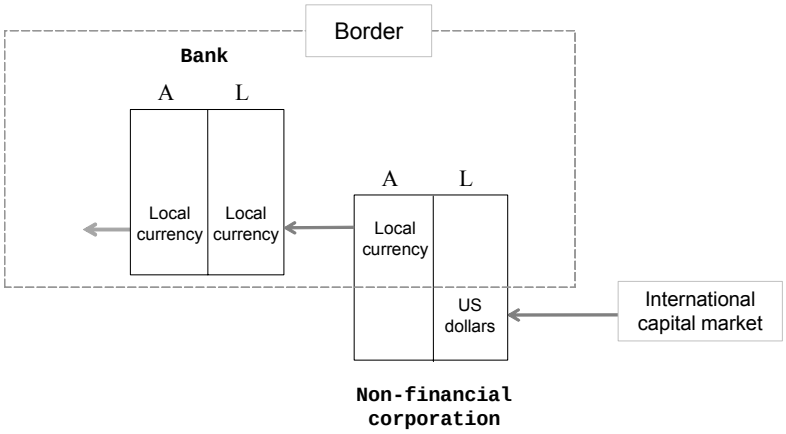

Figure 1. Example of a Non-Financial Corporation Acting as a Surrogate Intermediary by Borrowing through an Offshore Subsidiary and Transferring the Proceeds to Headquarters (Source: Chung et al., 2015)

centres. In such instances, neither the borrower nor the lender need to be a resident of the home EME jurisdiction, and the liabilities incurred by such entities will not be captured by traditional balance of payments measures. Avdjiev et al. (2014) and Chui et al. (2014) have highlighted the role of offshore affiliates as the financing vehicles of EME corporate borrowers in international capital markets. Having obtained funds abroad, the foreign affiliate of an EME corporation could transfer funds to its home country through a variety of channels, for instance by lending directly to its own headquarters.

Figure 1 illustrates an example, wherein a non-financial firm taps the international capital markets through a bond issued by its offshore subsidiary, which then lends the proceeds to headquarters through a within-company loan. The within-company loan by the offshore affiliate to its headquarters is classified as FDI in the balance of payments, and presents opportunities to circumvent capital controls (see Avdjiev et al (2014) and Chui et al (2014)). Figure 1 depicts the headquarters firm providing funding to a local bank, but the financing could equally be provided to a non-bank financial intermediary - for instance, a “shadow bank" that performs bank-like intermediation functions, and which operates outside the regulated banking sector. The funds brought onshore could also be used by the firm to supply credit to another firm by

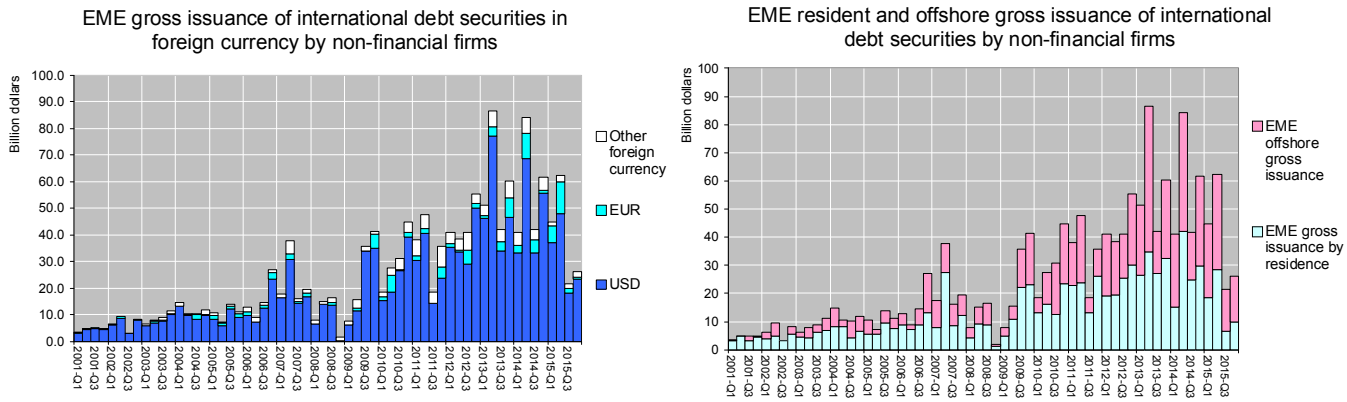

Figure 2. **Quarterly gross issuance of EME non-financial corporate bonds in foreign currency.** The left panel shows quarterly gross issuance of long-term (over 1 year maturity) EME non-financial corporate bonds by issuance currency. The right panel shows the breakdown in terms of issuance by residents and offshore issuance. Source: BIS international debt securities statistics by nationality and by residence.

buying its commercial paper or other financial instruments.

Regardless of the specific form of the financial asset, the practice of bringing funds offshore has the potential to affect domestic financial conditions. Global financial conditions could then be transmitted to the domestic economy. For instance, Bruno and Shin (2015) report that dollar-denominated corporate bond issuance has been used by EME corporates to accumulate financial assets, as well as to finance real invemestment. To the extent that the newly accumulated financial assets are in domestic currency, the practice of issuing dollar bonds to finance domestic claims then has attributes of a "carry trade" where financial assets in domestic assets are funded by dollar liabilities. Bruno and Shin (2015) find that approximately 22 cents of each dollar of the proceeds of a dollar bond issuance ends up financing cash and short-term investments on the firm's balance sheet. Moreover, they find that EME firms are likely to issue USD-denominated bonds if the firm starts out with large cash balances. Similarly, the practice of using offshore affiliates as financing vehicles by EME non-financial firms can also be important in this context.

Figure 2 presents aggregate data from the BIS on gross bond issuance in foreign currency by EME non-financial corporates. The left panel shows the currency breakdown, illustrating the

dominant role of the US dollar. The dollar accounts for 86% of all foreign currency issuance since 2001. The right panel breaks down the same total into issuance by EME residents versus issuance by their offshore affiliates. Since 2010, approximately 50% of the total issuance has been conducted by the offshore affiliates of EME corporates.

Our paper addresses the consequenes of the twin features highlighted above - the importance of offshore subsidiaries as the financial vehicle for EME corporate borrowers and the dominant role of the US dollar. The first feature points to the importance of examining offshore issuance in more detail, and the second feature (role of the dollar) points to the importance of US monetary conditions as being possibly an important driver of the transmission of global liquidity.

In this paper, we provide an empirical investigation of how the transmission channels of global liquidity depend on the offshore issuance of EME firms, and how the channels may have changed with the shift in the relative incidence of bank and bond financing. We draw attention to the new channels of global liquidity which operates through (1) the issuance of international debt securities of emerging market corporations and (2) the particular role played by debt securities issued in offshore locations. We show that these channels of global liquidity were weak at best before the global financial crisis, but has emerged as a prominent transmission channel of cross-border financial conditions.

In terms of empirical methods, we use panel vector auto regressions (VAR) that identify shocks to global financial conditions. The use of panel methods offers two important advantages. First, given that our empirical investigation covers a relatively short time period after 2010, the use of cross-sectional information, which is conveyed by the panel structure of the data, strengthens this study's statistical inference by allowing us to utilize the information in the cross-section of capital recipient countries.

Second, the panel structure of our investigation allows us to make inferences on the common factors that similarly influence a wide range of jurisdictions. The term "global liquidity" denotes the influence of such common factors. The panel VAR method is employed to analyze the effect of the common component on recipient economies in similar ways.

Our approach is to arrange the variables in the panel VAR into two groups: the variables

at the source (i.e., United States) and those at the destination (i.e., a group of 22 emerging countries). As our variables at the source, the US real GDP and the US domestic credit (which is measured by the BIS) are taken together as the summary of the financial system at the core. They indicate the state of the economy and credit conditions at the source. In order to correctly infer the effects of global liquidity shocks by excluding the endogenous responses of global liquidity from aggregate economic activities, global (or US) liquidity shocks are identified as credit innovations orthogonal to US GDP innovations . In extended experiments, the US monetary policy variable is also considered to take account of US liquidity changes owing to US monetary policy actions. Then, as our variables at the destination countries, we take each country's real GDP, government bond yield, and the net issuance of the private sector international debt securities to infer the transmission mechanism.

Past studies have empirically examined the effects of global liquidity on emerging countries, but the incremental contribution of our paper is to shed light on the crucial role played by debt issued through offshore subsidiaries. Choi et al. (2014) investigated the effect of global liquidity trends on emerging countries using panel FAVAR but they only focused on macroeconomic effects and policy responses. Chen et al. (2012) analyzed the effects of global liquidity on the growth rate of receiving countries., while Moore et al. (2012) examined the effects of changes in the long-term US Treasury yields on the foreign ownership share of emerging market bonds and government bond yields in emerging countries to infer the effects of US large scale asset purchases. The present study examines the detailed transmission mechanisms by making a distinction between onshore and offshore issuance of international debt securities and investigating the effects of global liquidity itself on the economy. [3]

We have two main findings. First, an impulse to the US credit aggregates elicits a positive response in the destination country's GDP and a negative response in its sovereign bond yield. That is, credit expansion in the center is associated with more permissive financial conditions and real activity in the recipient economies. The results are broadly consistent with those

[3]The empirical methodology is also different. Moore et al. (2012) estimated the effect by employing a reduced form VAR model and a static regression method.

reported by Chen et al. (2012), Choi et al. (2014), and Moore et al. (2012).

Secondly and more importantly, we find that an impulse to the US aggregate credit variable leads to a strong positive response of the offshore bond issuance activity. Interestingly, such a positive response is strongly present only after 2010 and can only be weakly found in the earlier sample period. Caruana (2013, 2014), Shin (2013), and Turner (2014) have argued that the channels of the transmission of global liquidity have changed in recent years, which they did by simply demonstrating the general trends in outstanding international debt securities. The present study's results add weight to previous arguments by employing a formal econometric analaysis and documenting empirical evidence that is conditional on US credit shocks and US monetary policy shocks. This study's empirical evidence, which is conditional on credit shocks and monetary policy shocks, shows a clear difference between the roles of onshore vs. offshore bond issuance, and such a difference is difficult to find in the general trend data. We find that only offshore issuance plays a significant role in the post-crisis period. In addition, this study further provides empirical evidence that the strong role of offshore issuance in recent years is likely to be related to circumvention of capital controls.

The rest of the paper is organized as follows. Section 2 explains the empirical methods. Section 3 presents the results from the baseline model. Section 4 reports the results from the extended analysis. Section 5 concludes the study.

2 Empirical Method

We assume that an economy i can be described by the structural form VAR model expressed as:

$$G\left(L\right)y^{i}(t)=d^{i}+e^{i}(t),\ i=1,2,...,I \tag{1}$$

where $G(L)$ is an $m\times m$ matrix polynomial in lag operator L, $y^{i}(t)$ is an $m\times1$ data vector d^{i} is an $m\times1$ constant matrix, m is the number of variables in the model, and $e^{i}(t)$ denotes a vector of structural disturbances. We assume that structural disturbances are mutually uncorrelated; hence, $var(e^{i}(t))$ can be denoted as Λ, which is a diagonal matrix whose diagonal elements are

the variances of structural disturbances. The individual fixed effect, d^i, is introduced to control for country-specific factors that are not included in the model but affect each variable in the model.

We assume that the structural form model, equation (1), can be expressed in a block triangular form as

$$y^i(t) = \begin{bmatrix} y_1(t) \\ y_2^i(t) \end{bmatrix},\ G(L) = \begin{bmatrix} G_{11}(L) & 0 \\ G_{21}(L) & G_{22}(L) \end{bmatrix},\ d^i = \begin{bmatrix} d_1 \\ d_2^i \end{bmatrix},\ e^i(t) = \begin{bmatrix} e_1(t) \\ e_2^i(t) \end{bmatrix} \tag{2}$$

where $y_1(t)$, d_1, and $e_1(t)$ are $m_1 \times 1$ vectors, $y_2^i(t)$, d_2^i, and $e_2^i(t)$ are $m_2 \times 1$ vectors, and $G_{11}(L), G_{21}(L)$, and $G_{22}(L)$ are $m_1 \times m_1$, $m_2 \times m_1$, and $m_2 \times m_2$ matrix polynomials in lag operator L, respectively. We assume that $G_{12}(L) = 0$. This assumption is the restriction of block-exogeneity, which implies that $y_1(t)$ is not affected by current and lagged $y_2^i(t)$. In the empirical model, $y_1(t)$ is the vector of US variables, and $y_2^i(t)$ is the vector of each emerging country i's variables. This assumption can be justified because most emerging countries in our sample are considered small open economies. Moreover, the block-exogeneity assumption mitigates the degree of freedom problem, compared to a typical VAR model.

We pool the data and estimate the following reduced form block-exogenous panel VAR model with the individual fixed effect. The VAR model is given by

$$y^i(t) = c^i + B(L)y^i(t-1) + u^i(t), i = 1, 2, ...I \tag{3}$$

where c^i is an $m \times 1$ constant matrix, $u^i(t)$ is an $m \times 1$ residual matrix, $var(u^i(t)) = \sum$. In addition,

$$B(L) = \begin{bmatrix} B_{11}(L) & 0 \\ B_{21}(L) & B_{22}(L) \end{bmatrix},\ c^i = \begin{bmatrix} c_1 \\ c_2^i \end{bmatrix},\ u^i(t) = \begin{bmatrix} u_1(t) \\ u_2^i(t) \end{bmatrix} \tag{4}$$

where c_1 and $u_1(t)$ are $m_1 \times 1$ vectors, c_2^i, and $u_2^i(t)$ are $m_2 \times 1$ vectors, and $B_{11}(L), B_{21}(L)$, and $B_{21}(L)$ are $m_1 \times m_1$, $m_2 \times m_1$, and $m_2 \times m_2$ matrix polynomial's in lag operater L, respectively. Because the variables on the right hand side are different in this reduced form block-exogenous VAR model, OLS provides inefficient estimates because the variables on the right are different in this reduced form block-exogenous VAR model. Therefore, the reduced form block-exogenous

VAR model is estimated with seemingly unrelated regression. Then, to recover the structural form model, equation (1), from the estimated reduced form model, equation (3), we impose the restriction that the contemporaneous structural parameters are lower triangular, that is, $G_{11}(0)$ and $G_{22}(0)$ are lower triangular matrices, as in Sims (1980).

The baseline model is constructed as follows. In the first block, we include two variables, the US domestic credit (as given by the BIS series) and the US real GDP. We include the US real GDP because it represents aggregate economic activities in the US that are likely to affect credit conditions in the center and economic conditions of emerging countries. In this block, the US real GDP is assumed to be contemporaneously exogenous to the US credit because aggregate economic activities are likely to respond sluggishly to changes in financial variables such as the US credit, whereas financial variables are likely to instantaneously reflect all the information, including aggregate economic activities. A similar assumption has been used in past studies such as Sims and Zha (2006), Kim (1999), and Kim and Roubini (2000). In addition, this assumption implies that we control for aggregate economic activities when we identify shocks to liquidity or credit at the center. US liquidity is likely to be endogenous to aggregate economic activities of the US. If we don't control for aggregate economic activities of the US when we identify shocks to the US liquidity, the effects of the identified shocks are likely to include not only the true effects of changes in US liquidity but also the effects of changes in aggregate economic activities because aggregate economic activities of the US as well as the US liquidity are likely to affect emerging countries. Therefore, controlling for US aggregate economic activities of the US is important when identifying the shocks to the US liquidity. In fact, Bekaert et al. (2013) identified US monetary policy shocks with a similar identifying assumption.

In the second block of the panel VAR, we include three variables for each capital recipient country: real GDP, the net issuance of international debt securities, and long-term government bond yield of each emerging country. The latter two variables are of our main interests. We are interested in the effects of U.S liquidity shocks to credit availability and the long-term interest rate of emerging countries. Real GDP is included because it represents aggregate economic activities that are likely to affect the other two variables in the block. In this block, real

GDP and the net issuance of international debt securities are assumed to be contemporaneously exogenous to long-term government bond yield. This assumption can be justified because we use the end of period data for long-term government bond yield. That is, real GDP and the net issuance of international debt securities over each quarter is naturally contemporaneously exogenous to long-term government bond yield at the end of each quarter. Then, we assume that real GDP is contemporaneously exogenous to the net issuance of interantional debt securities. Again, this assumption is based on the sluggish real sector and fast-adjusting financial sector. At any rate, the ordering of the three variables does not matter when examining the effects of shocks to US credit, which is the main interest of this paper, because US credit is exogenous to the three variables in the model.

Two types of data on the net issuance of international debt securities are available: the *nationality*-based and the *residence*-based measures. We use the *residence*-based measure as the proxy for the onshore measure, and the difference between the *nationality*-based and the *residence*-based measures as the proxy for the offshore measure. The measures are exactly the same as the onshore and the offshore measures if foreigners do not issue international debt securities within the border of the emerging countries. The amount of international debt secruities issued by foreigners within the border of the emerging countries is small, so we use these proxies throughout the paper. Then, the *nationality*-based measure is the sum of *onshore* and *offshore* measures and comprises the whole issuance of international debt securities better than the *residence*-based measure. We use the *nationality*-based measure in the baseline model. We also use onshore (or the residence-based) and offshore measures in the extended models.

Our sample includes twenty two emerging countries: eight Asian countries/regions (China, Hong Kong, India, Indonesia, Korea, Malaysia, Thailand, and the Philippines), five Latin American countries (Brazil, Chile, Colombia, Mexico, and Peru), and nine European countries (Bulgaria, Czech Republic, Hungary, Latvia, Poland, Romania, Russia, Turkey, and Ukraine). Quarterly data are used, and sample periods vary among countries. The earliest sample starts from the first quarter of 2000, although this may vary across countries. The latest sample ends at the third quarter of 2014. See Appendix for details on data sources. Logarithm is taken and

multiplied by 100 for liquidity and real GDP. The net issuance of international debt securities is divided by the trend GDP and multiplied by 100.[4] Finally, because we follow the Bayesain inference, our statistical inference is not problematic in the presence of unit roots and cointegrating relations. We use the Monte-Carlo integration method, described in RATS (2013) to construct posterior probability bands for impulse responses. Sims (1988) and Sims and Uhlig (1991) presented a general discussion on Bayesian inference in the presence of unit roots and cointegrating relations.

3 Empirical Results

3.1 Results from Baseline Model

Figure 3 reports the impulse responses over eight years, with 90% probability bands. The labels for the shocks are denoted at the top of each column whereas the names of the responding variables are denoted at the far left of each row. The first column of graphs shows the impulse responses to US real GDP shocks. As can be seen, the US real GDP increases approximately by 0.59% on impact, increases further up to approximately 0.86 % in three quarters, and then decreases toward the initial level. The effect is persistent. The positive real GDP response is different from zero with 95% probability even after eight years. In response to such U.S real GDP shocks, the US credit aggregate increases persistently. The response reaches approximately 1.3% increase in four years and stays at a similar level even in eight years. Positive spillover effects are found in emerging countries; the GDPs of emerging countries show robust increases and the peak effect of approximately 0.61% increase is found in three quarters. The net issuance of international debt securities increases in the short-run. The government bond yield of emerging countries tends to increase in the short run, but the probability bands are wide.

These results also suggest that controlling for US real GDP shocks is crucial in identifying and properly capturing the effects of US liquidity shocks. We have constructed US credit shocks

[4] A linear trend is assumed. The results are similar when other trends (e.g., a quadratic trend and HP fileter) are used. The results are also similar when actual GDP, instead of the trend GDP, is used, as reported in Section 4.

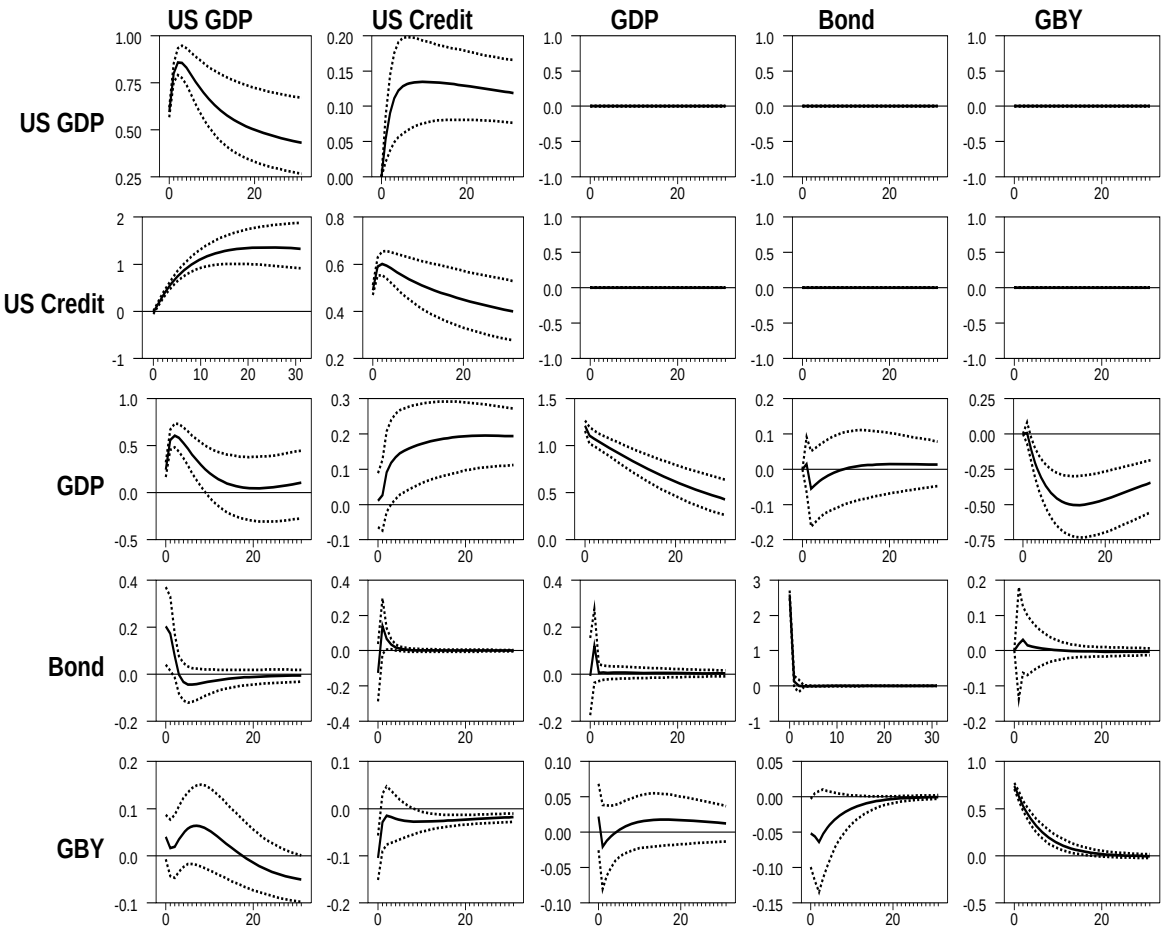

Figure 3. Impulse Responses: Baseline Model

as orthogonal to US real GDP shocks, implying that the endogenous responses of US credit to US real GDP shocks are excluded from the identified US credit shocks. In fact, US real GDP shocks affect US credit and the variables in the emerging countries substantially. Therefore, the effects of US credit shocks on emerging countries are likely to be obscured by the effects of US real GDP shocks on emerging countries if we don't control for the US real GDP shocks.

The second column of the graphs shows the impulse responses to US credit shocks that are of our main interests. As can be seen, the US credit increases on impact by approximately 0.49%, further increases in the next few quarters, by up to approximately 0.6%, and then decreases over time. The increase in US credit is highly persistent. Even in eight years, the US credit increase is 0.4% above the initial level. In response to such US credit shocks, US real GDP increases substantially and persistently. The peak response is approximately a 0.13% increase in two years. The long-term government bond yield of emerging countries declines persistently, which is different from zero with 95% probability at most horizons. The point estimates show that the initial effect is a 0.11% point decline and the effect after eight years is a 0.02% point decline. The fall in government bond yields likely reflects the economic condition of emerging countries, in which more credit is available because the US liquidiity spills over to emerging countries. The net issuance of international debt securities increases significantly in the short run. The increases at the third and fourth quarter horizons are different from zero with a 95% probability while about 0.066% point increase is found at the third quarter horizon. Thus, the issuance of international debt securities is an important channel, through which the US can generate a credit spillover effect to emerging countries. The real GDP of emerging countries also increases over time. Specifically, the increase from the third quarter horizon is different from zero with a 95% probability. Such an increase in real GDP is probably related to the decline in the long-term interest rate.

Meanwhile, shocks to the net issuance of international debt securities have a negative effect on government bond yields. The ease of credit condition via the issuance of international debt securities is likely to decrease the interest rate. Shocks to the government bond yield are associated to a strong and persistent decline in real GDP. In addition, an increase in the

long-term interest rate likely decreases investments and real GDP. Finally, shocks to the real GDP of emerging countries do not have significant effects on the net issuance of international debt securities and the long term government bond yield.

We also investigate the results for a more recent sample period. Figure 4 reports the impulse responses with 90% probability bands for the post-crisis period (i.e., from the first quarter of 2010 to the third quarter of 2014). As shown in the figure, the effects of US credit shocks on the US real GDP, and long-term government bond yields and the real GDP of emerging countries are qualitatively similar to those for the full sample period. The US real GDP increases strongly and persistently. The real GDPs of emerging countries also increase persistently. The long-term government bond yield declines significantly. In addition, the net issue in international debt securities increase significantly, which is different from zero with a 95% probability in the third quarter horizon.

3.2 Onshore versus Offshore International Debt Securities

In the baseline model, we investigate the effects of US credit shocks on the *nationality*-based issuance of international debt securities. However, the *residence*-based measure is often used in the traditional analysis. In relation to this, we investigate whether the result remains similar when we use different measures of the issuance of international debt securities. We replace the *nationality*-based measure with different measures, one by one, in the baseline model. Figure 5 shows the results for three measures, namely, the *residence*-based issues (or *onshore* issues), the difference between the *nationality*-based issues and the *residence*-based issues (or *offshore* issues), and the *nationality*-based issues (or the sum of *onshore* and *offshore* issues). In order to investigate how the results change after the global finacial crisis, we report the results for three sub-periods: the full-sample, the pre-crisis (from the first quarter of 2000 to the last quarter of 2006), and the post-crisis (from the first quarter of 2010 to the third quarter of 2014) periods.

The results show a clear change in the transmission channel after the global financial crisis. During the pre-crisis period, onshore issuances increase significantly, but offshore issuance responses remain insignfiicant. The increase of onshore issuances from the second to the thirteen

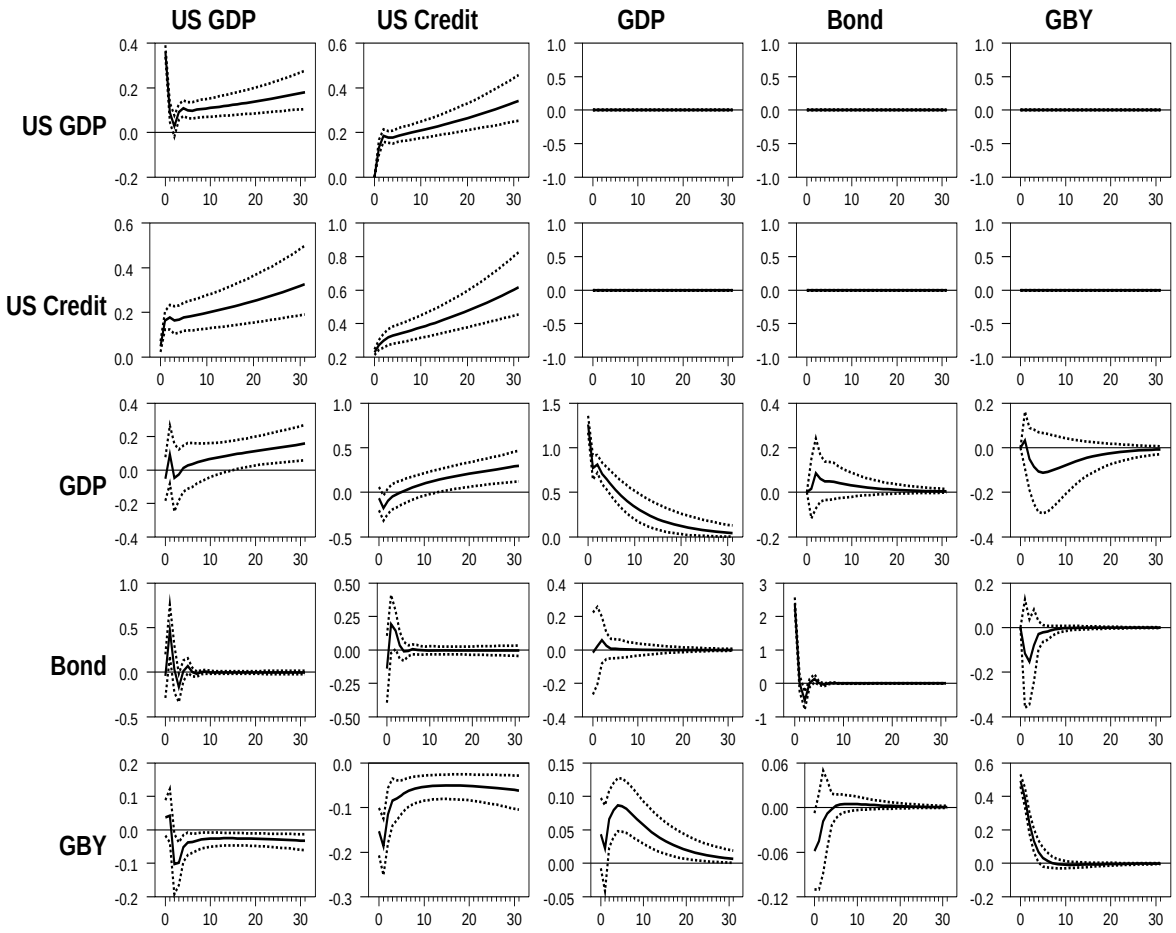

Figure 4. Impulse Responses in the Post-Crisis Period

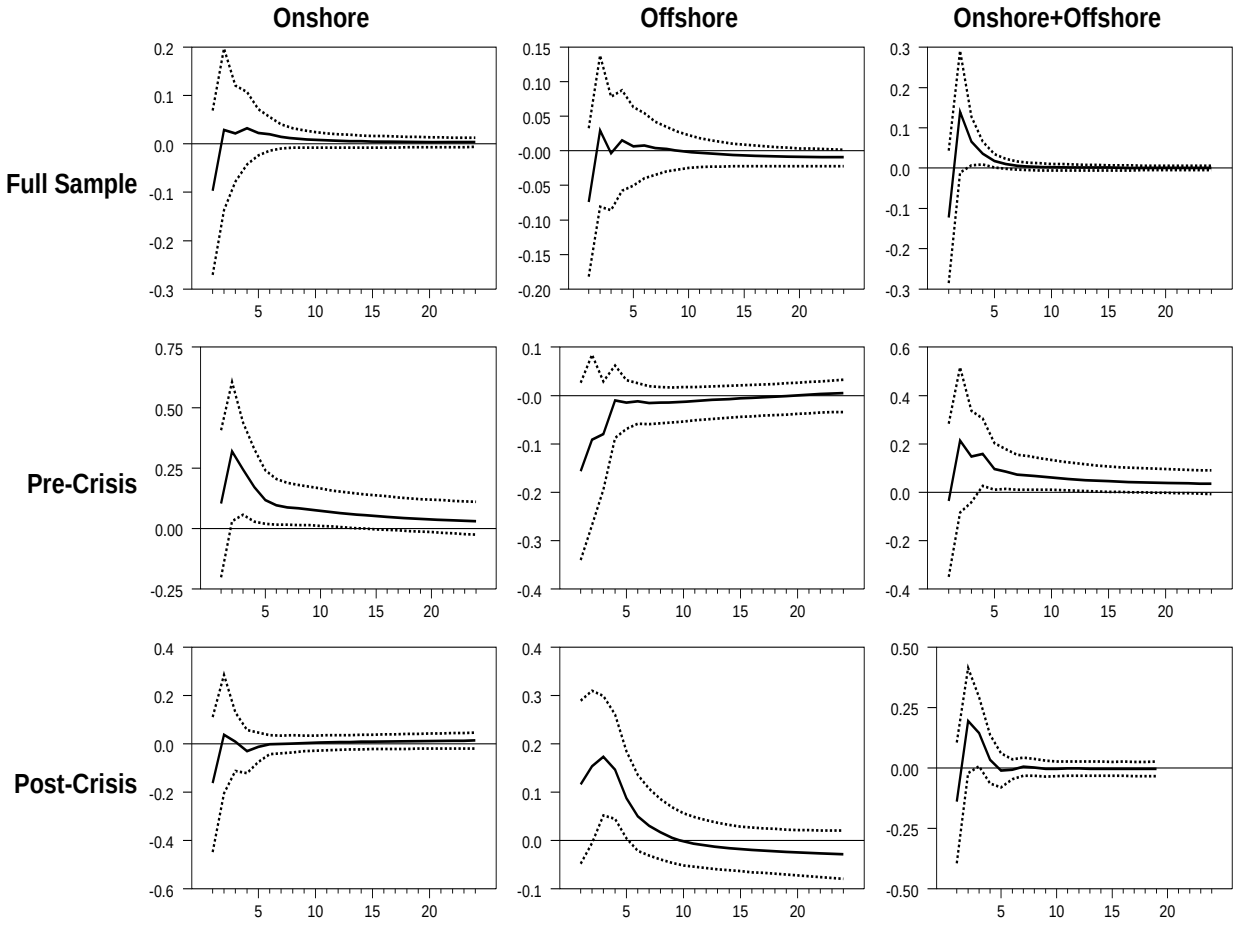

Figure 5. Impulse Responses to US Credit Shocks: Onshore and Offshore Issues in International Debt Securities

quarters is different from zero with a 95% probability, but the probability bands for offshore issuance responses include zero at all horizons. However, during the post-crisis period, the opposite role of onshore versus offshore issuance is observed. Offshore issuances increase significantly, but onshore issuance responses remain insignificant. The increase of offshore issuance from the third to fifth quarters is different from zero with 95% probability, but for onshore responses, the probability bands include zero at all horizons. These results suggest that the transmission channel of US credit shocks has changed from onshore to offshore international debt securities issuance.

Furthermore, the transmission of global liquidity through the issuance of international debt security could not be captured properly for the post-crisis period if one uses the traditional measure (i.e., the *residence*-based measure). Figure 5 shows that credit shocks only affect offshore issuance significantly (not onshore issuance) during the post-crisis period. Therefore, one may falsely conclude that the issuance of international debt security is not an important channel in the transmission of global liquidiity, by using the traditional *residence*-based measure. By contrast, the significant effect on the issuance of international debt security can be captured for the post-crisis period by using the *nationality*-based measure, which comprises both *onshore* and *offshore* issuance (Figure 5). The results for the full sample period (Figure 5) also show that the significant role of international debt security issuance can be captured using the *nationality*-based measure but not by using the *residence*-based measure.

Caruana (2013, 2014), Shin (2013), and Turner (2014) have recently suggested that offshore debt issuance has been an important channel of global liquidity in recent years, simply based on the general trends in outstanding international debt securities. We support the arguments by a formal evidence that is conditional on US credit shocks. Moreover, we show that the transmission channel of US credit shocks changed dramatically. Onshore issuance (not offshore issuance) plays a significant role in the pre-crisis period, but offshore issuance (not onshore issuance) plays a significant role in the post-crisis period. This stark contrast is difficult to find in the general trend data. For example, Figure 2 shows an increase in outstanding offshore issuance in recent years, but the size of outstanding onshore issuance is as large as the size of

outstanding offshore issuance even in recent years. Therefore, our empirical finding is far more dramatic than those of past studies.

4 Extended Analysis

4.1 Capital Controls and Offshore Issuance

The empirical results suggest that offshore issuance has become more important than onshore issuance for the transmission of global liquidity in recent years. In this section, we try to infer why the transmission channel has changed. Offshore issuance may increase in recent years as economic agents circumvent capital controls. For example, after global financial crisis, some countries may have increased the degree of capital controls to avoid huge capital inflows following the rise in the U.S. liquidity. In spite of strengthened capital controls, local borrowers still would like to obtain liquidity from the center with a low interest rate. To circumvent capital controls, multi-national firms may have issued international bond offshore and provided liquidity to headquarters and local borrowers.

To assess such a possibility, we first investigate whether each country in our sample increased capital controls after global financial crisis. To assess the degree of capital controls in each country, we use the measure of capital account restrictions constructed by Fernandez et al (2016). We compare the average value of the measure during 2000-2006 (the pre-crisis sample period used in our analysis) and that during 2010-2014 (the post-crisis sample period used in our analysis) for each country. We first form a group of countries in which the average value increased from pre- to post-crisis periods (which implies that the degree of capital controls increased). We also form a group of countries in which the average value decreased. Then, we investigate the effects of global liquidity shocks on offshore bond issuance in the post crisis periods in two groups.[5]

Figure 6 reports the impulse responses of offshore bond issuance to global liquidity shocks.

[5]The former group includes eight countries (Brazil, Chile, Czech Republic, Latvia, Mexico, Peru, the Philippines, and Turkey). The latter group includes twelve countries (Bulgaria, China, Colombia, Hungary, India, Indonesia, Korea, Poland, Romania, Russia, Thailand, and Ukraine).

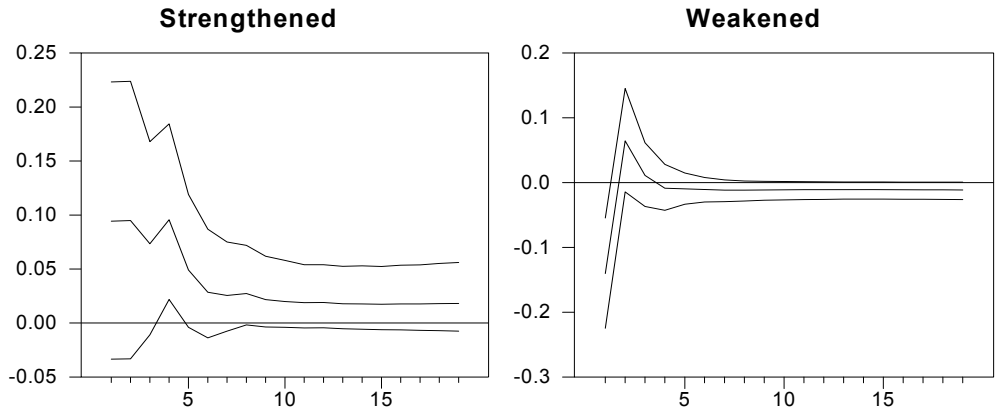

Figure 6. Impulse Responses of Offshore Issuance to Credit Shocks

In the group of strengthened capital controls, offshore bond issuance increases significantly. However, in the group of weakened capital controls, offshore bond issuance does not increase significantly. These results suggest that the changes in channels of global liquidity transmission from onshore to offshore issuances may be related to circumvention of capital controls.

4.2 US Monetary Policy Shocks

Global liquidity movements have various sources but many are interested in the US monetary policy action. In this section, we analyze whether international debt security is an important international transmission channel for US monetary policy shocks. Here, we extend the baseline model to add an additional variable for monetary policy actions in the US or world block. The Fed conducted conventional monetary policy by using the Federal Funds rate (FFR) as the policy instrument during the sample period. We add the Federal Funds rate in the post-crisis period. However, the Fed also used unconventional monetary policy, and the FFR remained at zero level during the post-crisis period. To properly reflect unconventional monetary policy actions under zero lower bound, we used the shadow Federal Funds rate (FFRS) from Wu and Xia (2016) for the post-crisis period. We assume that the US real GDP is contemporaneously

exogenous to the policy variable, which is similar to the baseline model. In addition, in order to examine the effects of monetary policy actions that possibly affect credit contemporaneously, we assume that the policy variable is contemporaneously exogenous to the US credit. The results are similar even when we assume that the US credit is contemporaneously exogenous to the US policy variable. As we did for the baseline model, we estimate the model by offshore issuance and onshore issuance, one by one.

The results are reported in Figure 7. In the pre-crisis period, onshore issuance tends to increase more than offshore issuance does. An expansionary FFR shock increases onshore issuance significantly and persistently. The increase from the fourth to fourteenth quarter horizons is different from zero with more than 95% probability. However, an expansionary FFR shock increases offshore issuance significantly only on impact. Except for the initial quarter, 90% probability bands include the zero line. Neither onshore nor offshore issuance increases significantly in response to credit shocks. On the other hand, offshore issuance plays a significant role but onshore issuance does not in the post-crisis period. Both FFRS and credit shocks have significant effect on offshore issuance. The increase of offshore issuance at seven quarter horizon in response to FFRS shocks is different from zero with 95% probability. The increase at the third and fourth quarter horizons in response to credit shocks is different from zero with more than 95% probability. However, neither FFRS shocks nor credit shocks have a significant effect on onshore issuance.

4.3 Extended Experiments

We conduct various extended experiments to check the robustness of our main results. First, we allow feedback relation from emerging countries to the US by dropping the assumption of block-exogeneity. This means that $G_{12}(L)$ (in equation 2) is not necessarily zero. We estimate five-variable panel VAR model with recursive zero restrictions on contemporaneous structural parameters. We assume that US variables are only contemporaneously exogenous to the variables of each emerging country. Then, we assume that the US real GDP is contemporaneously

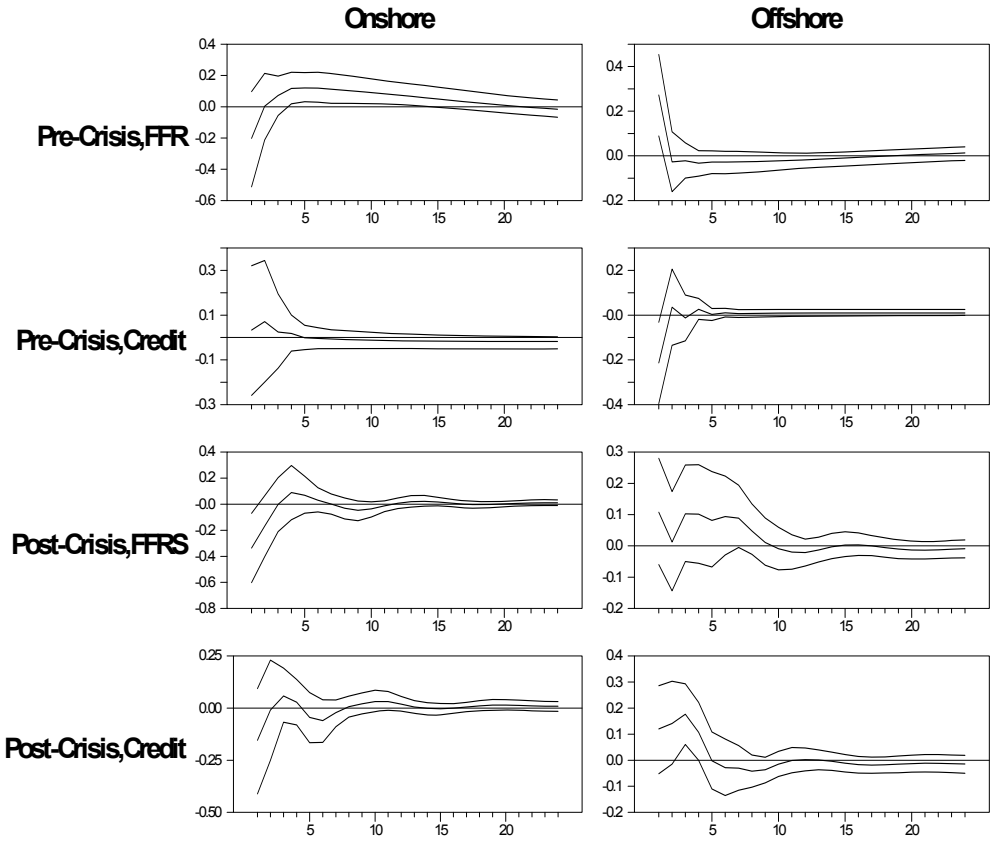

Figure 7. Impulse Responses of Onshore and Offshore Issuance to US Monetary Policy and Credit Shocks

exogenous to the US credit, which is similar to the baseline model. Second, we use the net issuance of international debt security divided by the trend output in the baseline model, but now we employ a different scaling method. We divide the net issuance of international debt security by actual output.

Figure 8 shows the impulse responses of onshore, offshore, and the sum of onshore and offshore measures. The first and third rows of graphs show the results for the pre and post-crisis period, respectively, when the block-exogeneity assumption is dropped. The second and fourth rows of graphs show the results for the pre- and post-crisis periods, respectively, when the measures are divided by the actual output. The results are qualitatively similar to those of the baseline model. The onshore measure increases significantly in the pre-crisis period, but the offshore measure increases significantly in the post-crisis period.

We further check the robustness of the results by including additional variables in the model. First, we include the world dollar credit measure (LIQD) instead of the US domestic dollar credit measure because the empirical model becomes richer and may better explain the international transmission of US dollar credit shocks. Second, we include VIX in the model. VIX represents the world-wide risk condition that may affect the capital flows and net issuance of international debt securities of emerging countries. We include world dollar credit and VIX in the US block, one by one. We assume that the US real GDP is contemporaneously exogenous to the US domestic credit, which is similar to the baseline model. In addition, we assume that credit is contemporaneously exogenous to the added variable in each model. Third, we add the exchange rate of emerging country against the US dollar (ERA) in the model since some past studies such as Hofmann, Shim, and Shin (2007) suggest that an appreciation of emerging country against the US dollar is associated with a compression in sovereign yield spreads and a rise in portfolio inflows into EME bond funds. We add the exchange rate of emerging country against the US dollar in the emerging country block.[6]

Figure 9 shows the impulse responses of onshore, offshore, and the sum of onshore and

[6]We also construct the model in which the effective exchange rate of the US dollars is additionally included in the US block. The main results are similar to those of the baseline model.

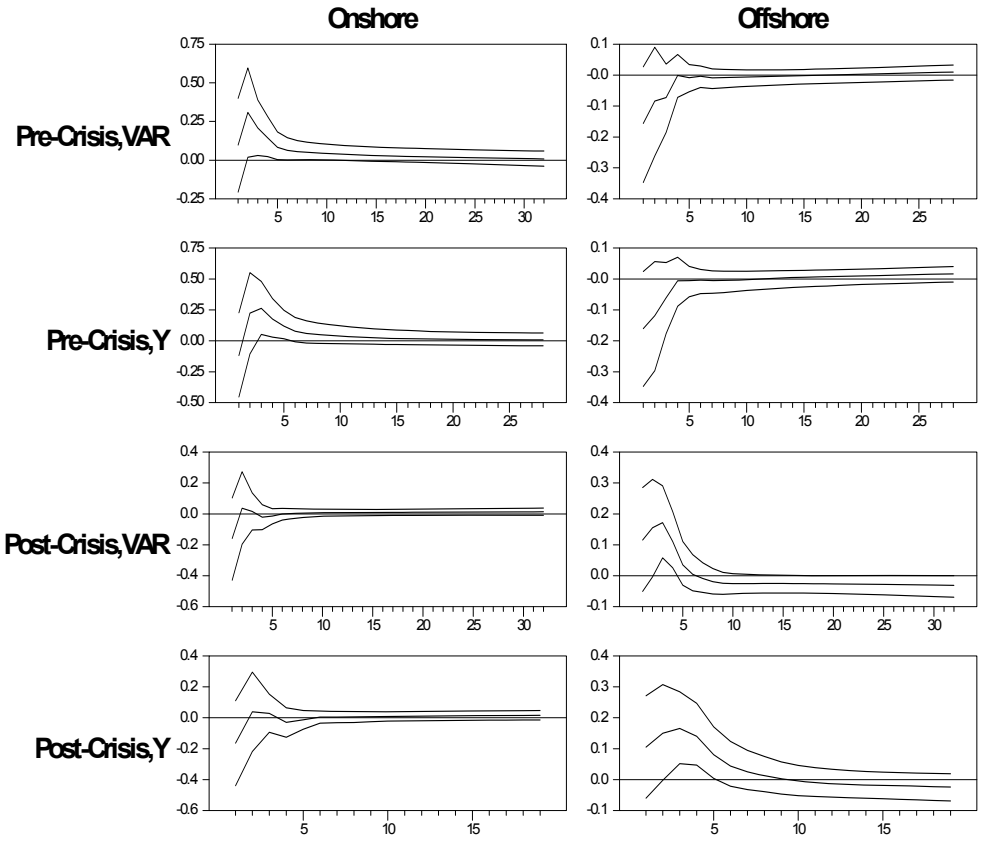

Figure 8. Impulse Responses to US Credit Shocks on Onshore and Offshore Debt Issuaneces: Extended Model 2

offshore measures. The first and fourth rows of graphs show the results for the pre- and post-crisis periods, respectively, when the world dollar credit is added. The second and fifth rows of graphs show the results for the pre- and post-crisis periods, respectively, when VIX is added. The third and sixth rows of graphs show the results for the pre- and post-crisis periods, respectively, when the exchange rate against the US dollar is added. The results are qualitatively similar to those of the baseline model.

5 Conclusions

Our study of the transmission channels of global liquidity highlights the shifting channels of the cross-border transmission of financial conditions. In particular, we have seen the greater importance of the offshore issuance of international debt securities by emerging market borrowers after 2010. Our results highlight the importance of monitoring institutional developments in international banking and capital markets. Our results point to the need to conduct an in-depth study of the factors determining the relative weight between onshore and offshore financing and how the relative incidences of onshore and offshore financing are affected by institutional features and regulations at the recipient country and by the monetary policy and financial conditions at the core of the global financial system. Our results also suggest that emerging markets should be aware of this recent change in the transmission channels of global liquidity, so that they can make appropriate measures against possible future reversals.

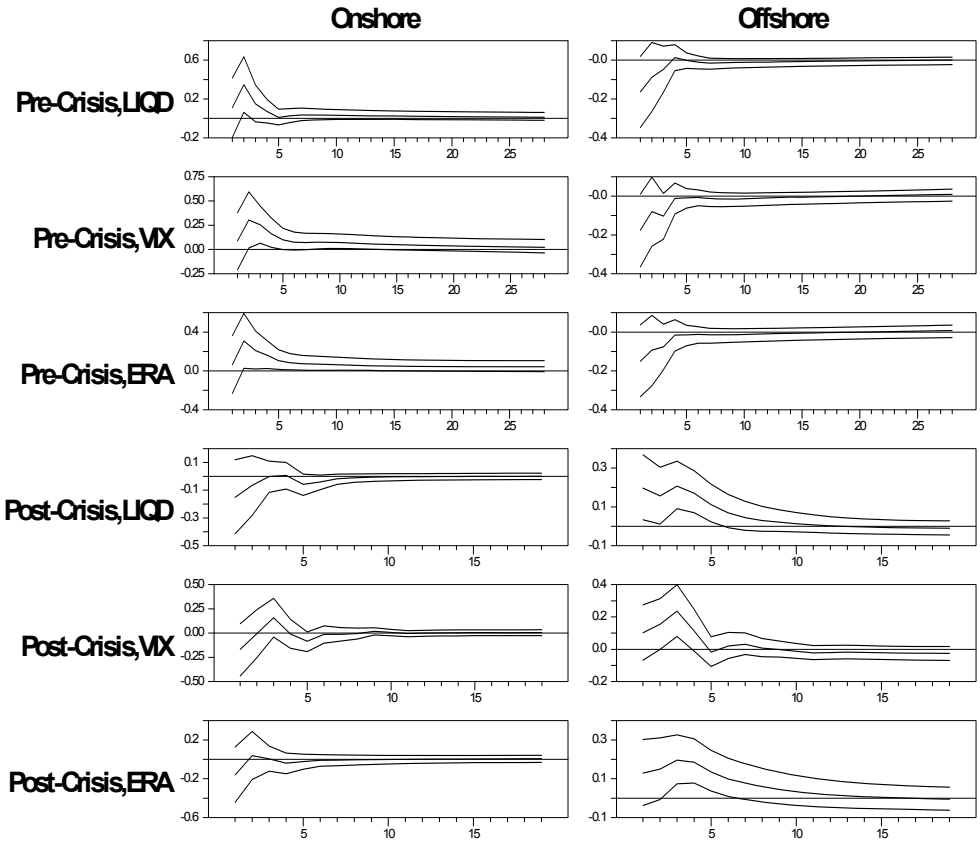

Figure 9. Impulse Responses to US Credit Shocks on Onshore and Offshore Debt Issuances: Extended Model 2

A Appendix. Data

The real and nominal GDP's of the U.S are obtained from *OECD Statistics*. The real and nominal GDP's of emerging countries are obtained from *International Financial Statistics*. Long-term government bond yield is obtained from *Bloomberg*. Data on the US Dollar domestic credit, the world dollar credit, and net issues in international debt securities based on residents and nationality are obtained from the web-page of Bank for International Settlements. VIX is obtained from *FRED*.

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