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External Debt Financing and Macroeconomic Instability in Emerging Market Economies

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Abstract

We study the relationship between external debt financing and risk to macroeconomic stability using a panel vector autoregression model for a sample of ten major emerging market economies. We also focus on the linkages of key channels of external debt financing, namely external debt securities and cross-border loans. We find that external debt securities substantially impact the yield spread and the exchange rate for emerging market economies, both before and after the global financial crisis of 2008. On the other hand, the impact of cross-border flows is found to be relatively subdued for these economies in the post-crisis period. We also find that emerging economies that were already receiving a high level of external debt securities inflows experienced a relatively larger yield compression and greater exchange rate pressure compared to the economies that had a low level of external debt securities flows. It indicates higher risk exposure for EMEs with larger external debt securities flows.

Keywords: External debt securities, cross border loans, financial stability risk, panel VAR.

JEL Code: E44, E51, F34, F62, F65, G15

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1 Introduction

External debt financing (EDF) through the bond market and bank loans have received considerable attention due to its substantial rise in emerging market economies (EMEs) in recent times (Figure 1).[1]. It has become a dominant component of capital inflows to EMEs in the aftermath of the 2008 Global Financial Crisis (IMF, 2018). Several factors are responsible for this phenomenon, including easier global liquidity conditions, lower real interest rates in advanced economies, search for higher yield, risk diversification and financial deregulation in EMEs (IMF, 2016a; Miyajima et al., 2014; Mohanty and Rishabh, 2016).

EDF provides emerging economies access to additional financial resources to achieve their growth and investment objectives. It also facilitates consumption and investment smoothing in addition to higher liquidity and efficiency in the banking system (Agenor and Montiel, 2015). However, the actual benefits of the recent EDF surge in EMEs remain questionable because it poses challenges to the financial stability of EMEs, especially during extreme capital flow episodes (**?**Forbes and Warnock, 2012). There are wider repercussions of debt flows at different levels for such economies as documented in the literature. At the micro level, such borrowings are more likely to get concentrated in larger corporations in EMEs that can negatively affect income distribution, employment, and output. At the macro level, the economy might face the loss of macroeconomic stability due to the pro-cyclical and highly volatile nature of short-term debt flows. Furthermore, distortionary domestic allocation of these resources can have negative spillovers on output growth and contagion effects on other economies in times of crisis and reversal of the inflows.

With this background in mind, we empirically examine the potential effects of EDF and its different components on the macroeconomic instability of EMEs in this paper. First, we explore the role of EDF and its different forms in posing a macroeconomic risk in the context of the Global Financial Crisis (henceforth, GFC) of 2008. Second, we inquire if EMEs with persistently high and low volumes of EDF observe differential macroeconomic instabilities.

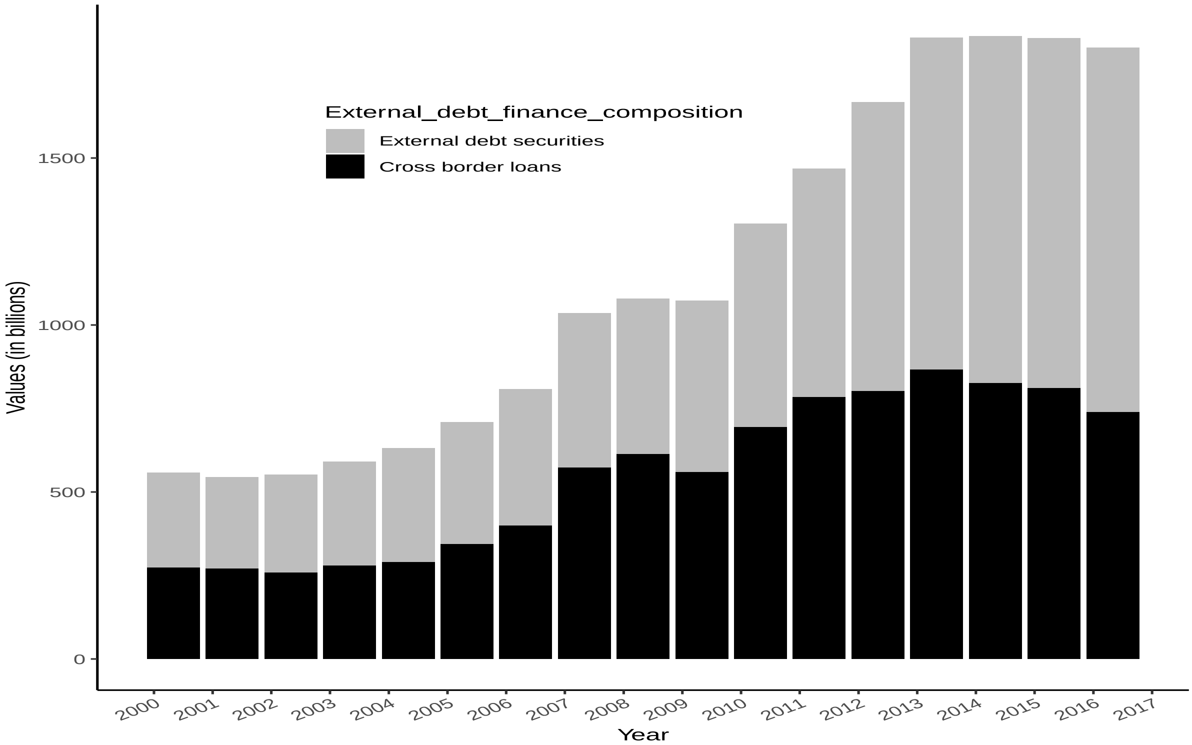
Two main channels of EDF transmission in EMEs are cross-border bank loans (CBL) and external debt securities (EDS) issuance (BIS, 2011).[2] Figure 1 shows that EDF, mainly through these two channels, amounted to $1.5 trillion in 2016 for EMEs which is twice the amount compared to the previous decade.[3]

[1]External debt financing (EDF) mainly refers to cross-border bank loans (CBL) and external debt securities (EDS) issuance by corporates.

[2]Cross border loans refers to total claims/lending of international banks to the countries; external debt securities are primarily bond issuance in the international market by domestic corporations.

[3]For a list of sample EME countries, see section 2 on data.

Figure 1: Composition of EDF in EMEs



Note: Figure 1 represents a comparison between cross border flows (CBL) and external debt securities issuance (EDS) in the previous two decades. It also indicates that CBL flows and EDS have significantly risen post-GFC (2008). This is an interesting trend because CBL flows have traditionally remained a key source of external debt financing but EDS has increasingly become an important channel of EDF flows to EMEs post-GFC.
Source: Data from IDS, LBS(BIS); Values in USD billion

Global liquidity transmission to EMEs, in form of CBL and EDS, followed two distinct phases marked by pre and post GFC (Shin, 2013; Rey, 2018; Bruno and Shin, 2015). Cross-border loans were a dominant channel of global liquidity transmission during the first phase, prior to GFC (2008). EMEs went through gradual deregulation of the domestic financial system combined with easy financial conditions across borders. It incentivized global banks to increase lending through excessive leverage during this phase. In contrast, in the second phase (post-GFC), external debt securities increasingly replaced the dominant role of cross-border loans in EMEs (Ehlers and Villar, 2015; McCauley et al., 2015b). During this period, cross-border bank loans reduced due to tightened banking regulations and deleveraging of global banks to contain their financial vulnerabilities post GFC.

Lower real interest rates in advanced economies post GFC seems to have pushed international investors to extensively participate in EMEs' debt securities market 'in search for higher yields' and risk diversification (Arslanalp and Tsuda, 2014; Miyajima et al., 2014). Additionally, external debt securities were relatively more liquid, less regulated and cheaper to monitor compared to cross-border loans. These are the key factors that contributed to the surge of EMEs' external debt securities flows to EMEs (Choudhry, 2003; Shirai, 2001). The shift in global liquidity transmission post-GFC, from subdued cross-border lending flows to a rapid increase in external debt securities issuance, was dubbed as the 'second phase of global liquidity' (Shin, 2013). This distinct transition in EDF flows may reveal different kinds of macroeconomic vulnerabilities that is partly our focus here.

EMEs also face a number of risks due to the recent surge of EDF flows given its strong association with favorable external financial conditions. In particular, longer inflow episodes are generally followed by greater contraction once outflows take place due to global liquidity tightening (Ramos-Francia and García-Verdú, 2015). Direction and volatility of such flows to EMEs have remained highly responsive to the US monetary policy in the aftermath of the GFC and the Taper Tantrum episode of 2013. Unconventional monetary policy of the US Fed and announcement of its potential reversal (2013) led to highly volatile exchange rate movements and large capital outflows that highlight the susceptibility of the EMEs to potential external shocks[4] (figures 2 and 3).

EMEs continue to remain vulnerable to global credit market reversals and high debt servicing ratios once global real interest rate starts to move upwards post economic recovery of advanced economies. Since EMEs are mostly on the borrower side of global capital flows, they face several challenges to their financial and macroeconomic stability due to extreme flow movements (Philip, 2014; Mizen et al., 2012; McCauley et al., 2015a; Forbes and Warnock, 2012). First, the banking sector of these economies is vulnerable due to its enormous borrowing from global banks and the international debt market. Such extensive international exposure of domestic banks leads to interest rate and exchange rate risks in the face of reversal in global real interest rates and domestic currency depreciation. Second, EMEs' corporations also fund risky carry trade activities by tapping into international debt market and a substantial part of EDF is obtained by first time issuers. Such risky activities can exacerbate financial vulnerabilities of EMEs in face of global shocks. Third, emerging market firms have increasingly obtained external financing through its offshore affiliates which may pose a threat to the domestic financial system during global liquidity tightening. Lastly, shifting borrowing pattern of these firms post-GFC might send a wrong signal about apparent credit expansion in the economy[5]. It can further mislead the policymakers and counter-measures to avoid overheating of the economy may not be adequate.

Recently, a number of studies have focused on issues related to EDF and potential challenges faced by EMEs (Kohlscheen and Rungcharoenkitkul, 2015; BIS, 2015; Miyajima et al., 2014; Shin and Turner, 2015). However, empirical work on the contribution of the two main channels of EDF, cross-border loans and external debt securities, to pose stability risks in EMEs is limited and these relationships are not well understood in the context of GFC. Therefore, the purpose of our paper is to closely examine the role of these two channels of EDF in posing macroeconomic instability risk to EMEs.

We analyze two important questions here: First, we explore how different channels of EDF flows present

[4]Zero interest rate policy maintained by US Federal Reserve during post-crisis, to boost its economy, known as 'unconventional monetary policy'.

[5]EMEs firms have increasingly shifted their borrowing from global banks to international debt markets to finance their activities post-GFC (Shin, 2013)

macroeconomic risks to EMEs in the context of the global financial crisis (2008). As discussed earlier, EMEs observed two phases of global liquidity transmission that is largely synchronized with pre and post GFC periods. It would be helpful to understand the possible linkages between the components of EDF and potential macroeconomic risks faced by EMEs during these phases. Second, we explore whether the heterogeneous levels of total EDF and its different components, present differential macroeconomic stability risks to EMEs. It is an important issue to analyze because each emerging economy attracts a different level of EDF, raised through these two channels (Ghosh et al., 2018, 2014; Fernandez-Arias, 1996; Ahmed and Zlate, 2014). It is conditional on several country-specific and global factors (push and pull factors) such as the degree of capital account openness, financial market development, regulatory infrastructure, domestic business cycle, exchange rate stability and global liquidity condition. Such differentiated levels of EDF flows may lead to potential credit bubbles, pressurize exchange rate, interest rate and enhance financial risks due to the reversal of the cross border inflows.

We use the panel vector autoregression (panel VAR) estimation method and present a set of impulse response functions (IRFs) to analyze the objectives of the paper. First, we find that shocks to external debt securities (EDS) flows significantly affect macroeconomic risk indicators, *yield spread and exchange rate*, both during the pre and post GFC periods. The impact gets further intensified on the risk indicators post-GFC. On the other hand, we find that cross-border loan flows (CBL) pose a macroeconomic risk only post GFC. We interpret these results as evidence that the macroeconomic risks are more consistently linked with EDS flows. Further, we find evidence that while the macroeconomic risk indicators have become more responsive to CBL flows post-GFC, the magnitude of the responsiveness is lower compared to the EDS flows. It mainly indicates that shocks to EDS flows can be riskier for EMEs than shocks to CBL flows and its repercussions in case of global liquidity reversal may be larger for the financial stability of EMEs.

To analyze the second question in the paper, we split the sample countries into two categories according to the high and low volume of EDF flows to identify heterogeneity in EMEs based on the volume of the inflows. Using this categorization, we examine whether heterogeneous levels of EDF (also, its components EDS and CBL) flows affect EMEs differently. The panel VAR results show that the response of macroeconomic risk indicators to EDF shocks is larger for EMEs with high level of EDF flows compared to their low level counterparts. At the compositional level of EDF, results become more interesting and reflect different risk scenarios for EMEs that attract high and low volume of EDS and CBL flows respectively. We show that EMEs with high level of EDS flows are more susceptible to macroeconomic risks compared to EMEs with its low level. Whereas, there is not much difference in the response of CBL shocks for EMEs with high and low level of CBL flows. In other words, heterogeneous levels of EDS flows in EMEs seem to present differential macroeconomic risks to EMEs, unlike CBL flows.

The key findings of the paper evidently suggest that high volume of EDS flows have riskier implications for EMEs and its extreme movement can pose larger macroeconomic instability post-GFC. On the other hand, the volume of CBL flows does not present different risk scenarios for EMEs but its sudden movement might be riskier in the post GFC era. We importantly show relatively higher yield spread compression and exchange rate pressure in response to EDS shock pre and post crisis, which is not the case with CBL shock. In other words, EMEs face larger macroeconomic risks from EDS flows than CBL flows. We believe our paper contributes to the gap in the literature on the impact of key channels of external debt financing on macroeconomic stability in the context of emerging economies during the second phase of global liquidity post-GFC. We also contribute to understand the role of heterogeneous volumes of EDF and its components in posing differential risks to EMEs.

Our paper is related to several strands of literature that mainly examine the role of external debt flows, implications of global liquidity transmission and its channels (EDS and CBL) for macroeconomic and financial stability. It further elaborates on the benefits and challenges of cross border flows, debt dollarization and its compositional changes pre and post GFC. It is further linked with the literature on international financial integration, risk spillovers, vulnerabilities and recoveries of EMEs due to external shocks. To identify our contribution, we discuss two key strands of literature.

The first related strand of literature explores the dynamics of global liquidity, cross border flows, its determinants and implications in the context of emerging economies[6]. Global liquidity primarily divided into two parts; official and private sector component[7](BIS, 2011). This report emphasizes that private sector liquidity transmission is highly cyclical and its access depends upon macroeconomic fundamentals and more importantly risk appetite of international investors. It also points out that excessive liquidity could be a possible source of economic instability. Procyclicality of such liquidity can magnify domestic imbalances or potentially disrupt the domestic financial cycle. Other important determinants of global liquidity transmission to EMEs are listed as rising leverage in global banks, search for higher yield, interest rate differential, carry trade, the excess elasticity of financial system, higher yield spread and increased risk appetite of international investors (Schularick and Taylor, 2012; Borio and Disyatat, 2011; Obstfeld, 2012b; IMF, 2018).

IMF (2011) points out that an expanded level of cross border flows can be riskier for the macroeconomic and financial stability of EMEs. Potential financial stability risk due to cross border flows can be linked to global saving-investment discrepancies and easier financial liquidity conditions worldwide as emphasized by (Bernanke, 2005; Obstfeld, 2012a). According to Rey (2018), these risks propagate through highly synchronized financial conditions across borders which operate according to the global financial cycle[8]. On the other hand, capital flows in emerging economies obey ‘common global factors’ and their adjustment due to external shocks can drastically affect their business cycles. Forbes and Warnock (2012) further emphasize that episodes of extreme capital flows are mainly driven by global

[6]Global liquidity refers to global factors that channelize cross-border spillovers in financial conditions and credit growth to EMEs. It also denotes monetary policy spillovers from advanced economies to emerging economies (Shin, 2013)

[7]The official component of global liquidity refers to international funding available to settle claims across monetary authorities. Whereas, the private component refers to cross border operations of financial and non-financial corporations (BIS, 2011).

[8]Global financial cycles are characterized by boom and busts in asset prices. It is also considered accountable for the financial crisis due to surges and stop episodes of capital flows (Rey, 2018).

factors and entail risks to financial stability. They importantly point out that such episodes were largely dominated by debt led episodes, not equity led episodes. In other words, debt led episodes in extreme movement of capital flows are perceived to be riskier than equity led episodes.

Ciarlone et al. (2009) also indicate that EMEs are vulnerable to shifts in global financial conditions mainly caused by increased risk aversion and market volatility. Countries also experience excessive credit growth accompanied by large external debt inflows, followed by excessive retrenchment in the face of adverse common global factors (Avdjiev et al., 2017; Rey, 2018). Such credit booms are generally considered an important predictor of the financial crises and were an important cause of concern for EMEs (Gourinchas and Obstfeld, 2012; Schularick and Taylor, 2012; Lowe and Borio, 2002). Our paper contributes to this stream of literature by showing that heterogeneous volume of EDF flows and its components (EDS and CBL flows) exposes EMEs to differential susceptibility in response to shocks (or sudden movement) in these different kinds of flows.

The second strand of literature emphasizes the role and implications of two key channels of global liquidity, namely cross-border bank lending and external debt securities issuance by corporation in emerging markets. Theoretically, Diamond (1991) models borrowers' behavior to choose between bank loans and directly placed debt. It shows that moderately rated borrowers rely on bank loans while the highest and lowest rated borrowers issue bonds. This result is useful to understand EMEs relative preference between bank and bond loans for investment financing. Hale (2007) examine the borrowing behavior of EMEs in choosing between bank loans and bonds. The paper shows that that the least risky countries would issue high-quality bonds and most risky countries will not have access to markets. Moderately risky countries would issue low-quality bonds or borrow through banks. The paper further emphasize upon the importance of macroeconomic fundamentals to determine variations in the ratio of bond and loan financing in EMEs.

Bruno and Shin (2014) examine the role of cross-border bank lending as a channel of global liquidity transmission and its link with the state of the global financial cycle. They show that the leverage cycle of global banks typically reflects risk in the global financial system and it can have negative implications for emerging economies. Cross-border bank lending reduced globally due to European banks deleveraging and financial deglobalization post-GFC (Cerutti et al., 2017; Rose and Wieladek, 2014). On the other hand, Cetorelli and Goldberg (2012) empirically show that balance sheet shocks have contributed to the reduction in cross-border bank lending.

Appreciation of the US dollar is also shown to be associated with deleveraging of global banks and global financial tightening (Bruno and Shin, 2015; Adrian and Shin, 2010). McCauley et al. (2015b) show that there is a substantial increase in US dollar credit to non-bank borrower outside the US during the last decade. Further, they emphasize that US unconventional monetary policy played a significant role to shift dollar credit from global banks to global fund investors and channelized it toward EMEs post-GFC (2008). This transition was importantly named as "second phase of global liquidity" mainly due to search for higher yield in this phase by international investors (Shin, 2013). Such compositional changes in EDF may bear negative implications for EMEs, an important issue that we analyze in this paper.

To further substantiate the negative spillover of cross-border flows, Aldasoro and Unger (2017) find that reversal of bank loan supply has a strong and negative impact on real GDP and GDP deflator of the Eurozone despite the increase in other forms of financing such as equity and debt securities. Bond funds frequently exhibit run like dynamics which poses risk to financial and macroeconomic stability (Feroli et al., 2014). Ramos-Francia and García-Verdú (2015) also examine run-like dynamics for capital flows in EMEs and shows that US unconventional monetary policy accentuates such run like dynamics in EMEs as observed during taper tantrum episode. Given this background, we attempt to fill a gap in the literature on the potential repercussions of the second phase of global liquidity mainly in the context of EMEs. We analyze how EMEs are exposed to macroeconomic risk through different channels of EDF (external debt securities and cross border loans) and its transition pre and post GFC. In the following sections, we discuss in detail our strategy to explore these questions.

The remainder of the paper is organized as follows: Section 2 presents data and descriptive statistics. Section 3 discusses empirical strategy. Section 4 presents empirical evidence and section 5 concludes.

2 Data

In this paper, our objective is to analyze the role of EDF in triggering macroeconomic risks in emerging economies with a particular emphasis on its total volume and the share of its two components with reference to GFC. To explore this relationship, we use quarterly data on a sample of 10 major emerging economies over the period 2000Q1-2017Q1[9]. The list of sample countries includes Brazil, Chile, India, Indonesia, Malaysia, Mexico, Philippines, Russia, Thailand, and South Africa. Our sample time period encompasses both phases of global liquidity, as discussed in Section 1 that provides the relevant time framework to explore the main questions posed here.

We use Bank of International Settlement (BIS) database to obtain primary variables - external debt securities (EDS) and cross-border loans (CBL). External debt securities data is obtained from the BIS international debt securities statistics (IDS), whereas BIS locational banking statistics (LBS) is used to collect data on cross-border loans. Foreign currency denomination of external debt securities and cross-border loans is used in this study to account for the role of currency mismatch in EMEs' external borrowing. Definition of external debt securities is used as residence basis and ultimate risk borrower that follows the balance of payment (BOP) and the system of national account principles (Gruic and Wooldridge, 2015). Cross-border loans are defined here as loans and deposits of total claims of global banks in counterparty countries. We calculate total EDF for a country as the sum of external debt

[9] Sample EMEs are chosen from the classification provided in the statistical appendix of World Economic Outlook report (IMF, 2016b). These countries are selected due to their high degree of capital account openness and availability of detailed data for the given sample period. The sample period is chosen to avoid after-effects of Asian Financial Crisis (1997) on EMEs and provides longer and balanced data points pre and post GFC (2008).

securities and cross-border loans.

Another set of macroeconomic variables are selected from Thomson Reuters and IMF international financial statistics (IFS). These variables include data on 10-year government bond (G-secs) yield, nominal exchange rate (local currency vis-a-vis US dollar), CPI inflation, industrial production (IIP growth rate) and foreign exchange reserves as controls. We use percent change of the exchange rate in the estimation to remove panel unit root and make it free of any currency unit. Proxy of the macroeconomic risk of an economy is calculated as the yield spread between 10-year government bond yield of an emerging economy and of the US (Du and Schreger, 2016; Hofmann et al., 2016). We use the volatility index (VIX) to capture global risk uncertainty.

As discussed earlier, we use this data to analyze the dynamic relationship between EDF and macroeconomic risk in EMEs in two parts. We grouped EMEs into two categories; EMEs with high and low level of EDF, EDS, and CBL to inquire whether the heterogeneous volume of EDF flows had implications for macroeconomic instabilities in EMEs. We categorized countries according to each variable (EDF, EDS, CBL) in two steps. First, we calculated an average of the ratio of each variable to its nominal gross domestic product (NGDP) across sample time period (2000Q1-2017Q1); (sample average of EDF/NGDP, EDS/NGDP, and CBL/NGDP). Second, the median of these ratios is used to divide EMEs into countries with high and low level for each variable as shown in Table 1.

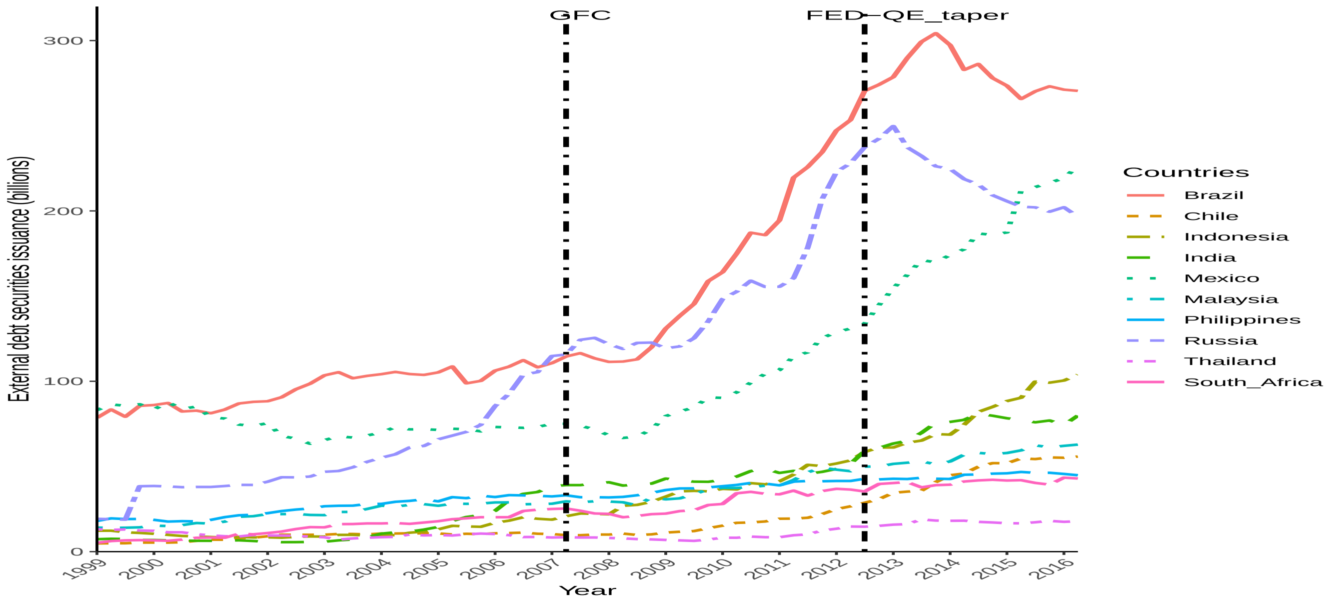
Table 1: Categorization of EMEs based on volume

External debt finance		Cross border loans		External debt securities	
High level	Low level	High level	Low level	High level	Low level
Brazil	India	Chile	Brazil	Brazil	India
Chile	Indonesia	Indonesia	India	Chile	Indonesia
Malaysia	Mexico	Malaysia	Mexico	Malaysia	Russia
Philippines	South Africa	Philippines	Russia	Mexico	South Africa
Russia	Thailand	Thailand	South Africa	Philippines	Thailand

Note: Countries are split into two parts based on volume of external debt finance (EDF) and its compositions external debt securities (EDS) and cross border loans (CBL). We use this categorization to examine different risk scenarios for EMEs with heterogeneous level (high and low) of EDF, EDS and CBL level.

2.1 Descriptive statistics

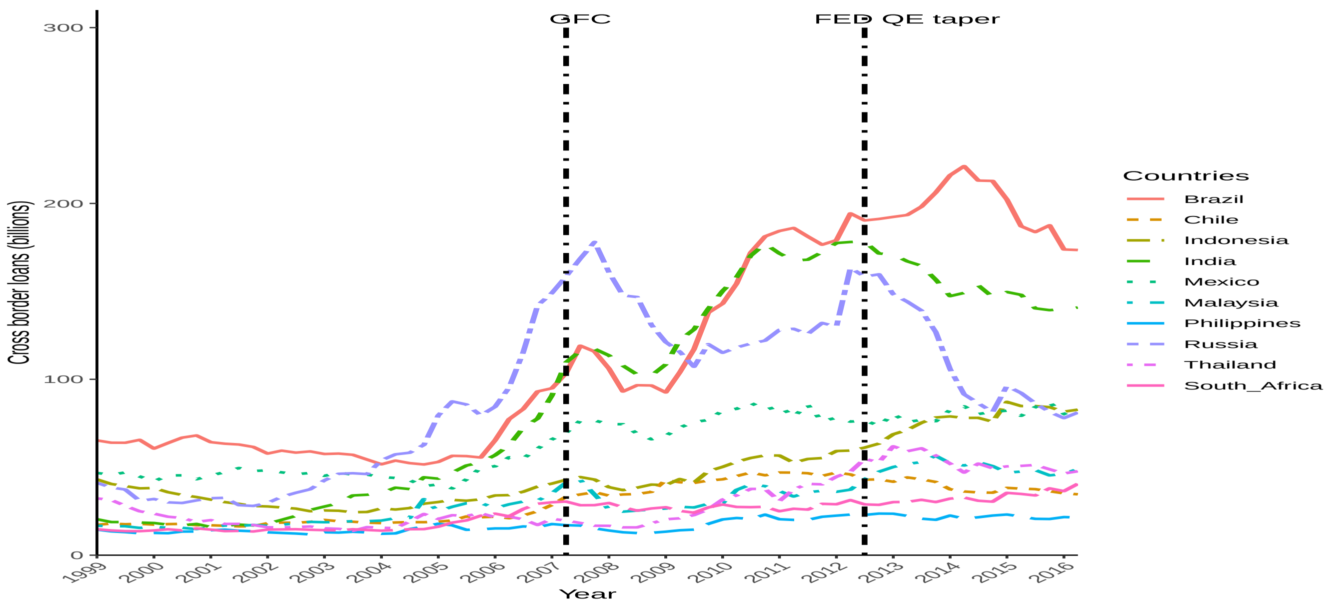
Figure 2: External debt securities issuance in sample EMEs



Note: We plot the data on external debt issuance (in foreign currency) for sample counties. Figure 2 shows the trend of EDS for sample period with break points at GFC and US Fed taper announcement represented by two vertical lines. It mainly shows gradual increase of EDS flows pre GFC. However, it rapidly picks up post GFC and the trend remain consistently positive for most of the EMEs post QE taper announcement.
Source: Data from IDS (BIS), Values are in USD billion.

Figures 2 and 3 show the trends of external debt securities and cross-border loans for sample EMEs. Vertical dotted lines in the plot represents two major external shocks faced by EMEs; GFC and Federal Reserve QE tapering announcement. Figure 2 clearly shows that EDS flows were almost stagnant during pre-GFC (2008), however, they rapidly pick up post-GFC for most sample EMEs and maintained upward momentum post-QE taper announcement news shock (2013). The figures reaffirm the idea of 'second phase of global liquidity' in which huge liquidity transmitted to EMEs in form of EDS flows after the crisis. At the country level, external debt issuance rapidly increased in large EMEs including Brazil, Mexico, and Malaysia post-crisis and it largely remains indifferent to taper announcement.

Figure 3: Cross border bank loans in sample EMEs



Note: We plot the data on total claims of global banks in the form of loan and deposits in sample counties. Figure 3 shows the trend of CBL for the sample period with breakpoints at GFC and US Fed taper announcement represented by two vertical lines. It mainly shows the volatility of CBL flows during these two events and the downward path of such flows post QE taper announcement.
Source: Data from LBS (BIS), Values are in USD billion.

Figure 3 indicates the movement of cross border loan for sample period and its distinct pattern during two major external shocks during the sample period. Several EMEs observed a huge decline in CBL flows post-GFC and it remained highly volatile between post-GFC and pre-QE taper announcement period. The decline in CBL was higher for big EMEs such as Brazil, Chile, Indonesia and India. For other EMEs, there is a gradual increase or stagnant trend in CBL flows in this period.

We further provide complementary summary statistics to the trends in CBL and EDS flows as well as domestic and external macroeconomic factors of sample EMEs (Table 2). Average EDF flows increase from 1.24 billion USD pre-GFC period to 3.55 billion USD post-GFC. In addition to this, the standard deviation of EDF flows has trebled between pre and post GFC sample period, which indicates increased volatility of such flows in the sample EMEs after the crisis. EDF volatility post-GFC mainly accounts for the high standard deviation for the full sample period (2000-2017). At the compositional level of EDF flows, average EDS flows have risen from 0.193 billion USD pre-GFC to 1.62 billion USD with two times higher standard deviation post-GFC. Whereas, average CBL flows increase from 1.04 billion USD pre-crisis to 2.11 billion USD with four times larger standard deviation post-crisis.

Table 2: Summary statistics for sample EMEs

Variables	**Full sample (2000-16)**		**Pre GFC (2000-08)**		**Post GFC(2009-17)**	
	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.
EDF (USD billion)	2.365	14.246	1.241	6.093	3.557	19.408
External debt sec (USD billion)	0.889	2.825	0.193	1.832	1.627	3.443
CB loans(USD billion)	1.572	14.258	1.048	5.639	2.112	19.491
Long-term interest rate	7.101	3.277	7.507	3.438	6.727	3.080
Short-term interest rate	5.117	3.275	5.729	3.674	4.450	2.624
Exchange rate (pct change)	0.722	5.386	0.535	5.465	0.920	5.302
IIP growth	2.801	5.919	4.300	5.237	1.316	6.183
Inflation	5.065	4.185	5.689	4.647	4.384	3.497
US long-term interest rate	3.540	1.234	4.538	0.700	2.452	0.612
VIX	20.149	8.086	21.084	8.852	19.160	7.065

Note: Table 2 lists key macroeconomic variable that captures domestic fundamentals of EMEs and external variables that affect EDF transmission to EMEs. We 10-year Gsec bond yield as Long term interest rate, 91 days treasury bill rate or call money rate as short term rate, percent change in the nominal exchange rate (vis-à-vis USD) as exchange rate and inflation rate is calculated from CPI index on YoY basis. US long term interest rate is 10-year Gsec bond yield. Difference between US long term interest and EMEs long term interest is calculated as yield spread for our analysis. The table mainly points out that EDS flows, on average, is lesser than CBL flows for the full sample. However, EDS flows, on average, have significantly risen post-GFC with lesser volatility. On the other hand, CBL flows have also increased with larger volatility in the similar period. Key macroeconomic variables, long term interest rate, short term interest rate, inflation and Industrial growth have declined post-GFC. Lower industrial growth represents bleak scenarios post-crisis. Average VIX index remains almost similar pre and post crisis period which indicates that persistent risk scenarios post GFC.

These trends suggest that there is substantial growth in EDS flows with relatively lower volatility compared to CBL flows post GFC period. The key variable accounting for increased EDF flows to EMEs post-GFC is yield spread as defined in section 2. It increased from 2.57 percent to 4.27 percent between pre and post GFC period. It mainly occurred because US long term interest rate halved after the crisis. This made EMEs assets more attractive and incentivized large EDF flows to EMEs.

Key domestic macroeconomic variables: long term interest rate, short term interest rate, inflation and more importantly, industrial growth have declined post-GFC. Lower industrial growth represents bleak post-crisis scenarios. Average VIX index remained high during pre and post-crisis periods implying higher uncertainty in global economy and persistent risk scenarios for EMEs. Altogether, dynamics of these variables shows that EDF flows have substantially risen post GFC but it has not translated into better growth outcomes for EMEs. In other words, it indicates that these huge inflows could be transitory in nature and it may present a macroeconomic risk to EMEs in face of the economic recovery of advanced economies and gradual rise in their real interest rates.

We further look into the performance of EMEs categorized into high and low level of EDF, EDS and CBL flow according to table 1. The summary statistics (as given in table 3-5) provides a background descriptive statistics for the second objective of the paper. It provides dynamics for domestic macroeconomic fundamentals and cross-border flows for EMEs with the heterogeneous level of EDF, EDS and CBL flows.

Table 3 shows that average EDF flows for EMEs with high level of EDF is 2.03 billion USD, whereas it is 1.6 billion USD for EMEs with low level of EDF. Also, the former group of countries experiences larger volatility (standard deviation) than the latter. On average, higher yield spread in high EDF countries provides fundamentals reason for EDF flows transmission to such economies.

Table 3: Summary statistics for EMEs with high and low level of EDF

Variables	**High EDF countries**		**Low EDF countries**	
	Mean	Std. dev.	Mean	Std. dev.
EDF (USD billion)	2.031	7.706	1.685	4.342
Long term interest rate	7.713	3.833	6.840	2.876
Short term interest rate	4.119	2.865	6.217	3.214
Exchange rate (in change)	0.007	0.059	0.008	0.049
IIP growth rate	3.251	6.507	3.416	6.432
Inflation	5.615	4.389	5.304	3.190
Yield spread	4.370	3.784	3.352	2.763

Note: Table 3 list key macroeconomic variable that captures domestic fundamentals and risk scenario of EMEs with high and low level EDF. We use this categorization later to analyze the potential differential response of risk indicators to EDF shocks for EMEs with the heterogeneous volume of EDF flows. Variable definitions are listed in table 2 note. High EDF countries observe higher EDF flows and higher volatility on average for the sample period. Higher yield spread in high EDF countries provides fundamentals reason for EDF flows transmission of such economies. However, at the domestic economy level, there is not much difference between inflation and growth rate of high and low EDF countries. It could also be indicative of the little contribution of such flows to the growth objective of EMEs.

However, at the domestic economy level, there is not much difference between mean inflation and growth rate of high and low EDF countries. It could also be indicative of the little contribution of such flows to obtain better growth objective in EMEs and its larger potential to disrupt financial stability.

Table 4 and 5 provide summary statistics at compositional level of EDF flows. Table 4 indicates that average EDS flows 1.338 billion for high EDS countries with higher volatility compared to 1.13 billion USD for low EDS countries. Further, it shows that average industrial growth is lower for EMEs with high level of EDS. It could be an indication of neutral response of structural variables in the EMEs that attract high level of EDS. Long term interest rate, short term interest rate and yield spread, on average, are lower for EMEs with high level of EDF. It indicates that there could be other important macroeconomic determinants of EDS flows to an EME such as high uncertainty in advanced economies. On the other hand, table 5 shows that average CBL flows is lower in EMEs with high level of CBL which is counter-intuitive. Further, we observe that growth rate is higher and inflation is lower in EMEs with high level of CBL flows. It reflects the linkage of higher CBL flows with relatively stable growth and price level movement in an EMEs.

Table 4: Summary statistics for EMEs with high and low level of EDS

Variables	**High EDS countries**		**Low EDS countries**	
	Mean	Std. dev.	Mean	Std. dev.
EDS (USD billion)	1.338	3.706	1.113	3.372
Long term interest rate	6.756	4.015	7.752	2.561
Short term interest rate	4.274	3.043	6.062	3.143
Exchange rate (in change)	0.007	0.053	0.009	0.056
IIP growth rate	2.853	6.268	3.859	6.650
Inflation	4.219	2.488	6.700	4.495
Yield spread	3.339	3.904	4.333	2.558

Note: Table 4 list key macroeconomic variable that captures domestic fundamentals and risk scenario of EMEs with high and low level EDS flows. Variable definitions are listed in table 2 note. We observe that industrial growth and inflation is lower for EMEs with high level of EDS. It could be an indication of the weaker association of structural variables in the EMEs that attract high level of EDS. Interestingly, the average yield spread is lower for EMEs with high level of EDF. It suggests that there could be other important macroeconomic determinants of EDS flows to an EME.

Table 5: Summary statistics for EMEs with high and low level of CBL

Variables	**High CBL countries**		**Low CBL countries**	
	Mean	Std. dev.	Mean	Std. dev.
CBL (USD billion)	0.324	2.350	0.940	5.999
Long term interest rate	6.272	3.194	8.227	3.310
Short term interest rate	4.620	2.907	5.716	3.419
Exchange rate (in change)	0.004	0.039	0.012	0.066
IIP growth rate	4.213	7.231	2.379	5.376
Inflation	3.805	2.939	7.113	3.919
Yield spread	2.865	2.930	4.797	3.423

Note: Table 5 list key macroeconomic variables that capture domestic fundamentals and risk scenario of EMEs with high and low level CBL. Variable definitions are listed in table 2 note. Average CBL flows is lower in EMEs with high level of CBL which is in contrast to the expectation. However, we observe that growth rate is higher and inflation is lower in EMEs with high level CBL. It reflects that higher CBL flows may also contribute to stable growth and price level movement in an EME. In other words, larger CBL flows can be steady in nature and positively associated with higher industrial growth in EMEs.

3 Empirical Strategy

Evaluation of a macroeconomic relationship requires taking into account several interdependencies that may exist across units of analysis such as firms, sectors, countries and their interaction with global conditions. Different channels of transmission and spillover also need to be taken into consideration to identify the existence of macroeconomic inter-linkages. Domestic interdependencies and idiosyncratic sectoral shocks within economies are likely to produce a domestic business cycle. Financial sector spillover to real economy represents a new channel of risk transmission identified during the GFC (Long Jr and Plosser, 1983; Stock and Watson, 2012; Ciccarelli et al., 2013). Additionally, the rising degree of global financial integration and trade substantiate the higher level of international interdependence between developing and developed countries (Canova and Pappa, 2007; Dees et al., 2007; Canova and Ciccarelli, 2012). Emerging economies similarly face such domestic and international interdependences that require us to take into account these factors to examine the dynamic relationship between EDF and macroeconomic risk.

There are two important ways to study the macroeconomic relationship in domestic and internationally interdependent economies. First, dynamic stochastic general equilibrium (DSGE) models where agents optimize their preferences subject to specified technology and constraints within multi-sector, multi-market and multi-country framework. These models are strongly parametrized and highly useful to obtain answers to important policy issues. However, they are subject to several restrictions and may not conform to the statistical properties of the data. DSGE models prove to be a useful benchmark but its specific design, based on certain assumptions, limit its scope to assess real-world situations (Canova and Ciccarelli, 2013).

Alternatively, panel vector autoregression (panel VAR) models capture dynamic interdependences present in the data with minimum restrictions, avoid explicit micro-structure of DSGE models and allows for shock identification through impulse responses. Panel structural VAR models are also subjected to standard criticism, similar to structural vector autoregression (SVAR) models, such as the use of informal restrictions and orthogonality restrictions to identify shocks (Hachicha and Lee, 2009; Canova and Pina, 2005). Nevertheless, panel VAR estimation improves upon DSGE analysis in additional dimensions where DSGE models usually fail. Panel VAR models are used to analyze spillover of an external shock on domestic variables and different channels of transmission across countries in response to international shocks (Ciccarelli et al., 2013; Rebucci, 2010). As our objectives are similar, we use a panel VAR estimation technique.

Panel VAR model shares a similar structure to the VAR model with addition of a cross section. Additionally, Panel VAR has two important characteristic features. It captures 'static and dynamic interdependencies' and also incorporates 'cross-sectional heterogeneity'. Static interdependencies are defined as errors correlated across cross-sectional units, whereas dynamic interdependencies enter in the model through lags of all endogenous variables for respective cross-sections. Finally, cross-sectional heterogeneity implies that variance and slope of shocks could be unit specific. A basic Panel VAR model is specified as follows :

$$Y_{it} = Y_{it-1}A_1 + Y_{it-2}A_2 + ... + Y_{it-p}A_p + u_i + e_{it}; \quad i = 1, 2......N, t = 1, 2....T_i \tag{1}$$

Where Y_{it} a $1 \times K$ dimensional vector of dependent variables, u_i is a $(1 \times K)$ vector of panel specific fixed effects and e_{it} is a $(1 \times K)$ vector of idiosyncratic errors. In this model, static interdependencies are captured by correlation of e_{it} across units, dynamic interdependencies are incorporated by Y_{it} lags and cross-section heterogeneity is included by slope and variance of e_{it}. This model can be further extended by including exogenous variables and it becomes panel VARX model, the form we use for our analysis in the paper. It is specified as :

$$Y_{it} = Y_{it-1}A_1 + Y_{it-2}A_2 + Y_{it-p+1}A_{p-1} + Y_{it-p}A_p + X_{it}B + u_i + e_{it}; \quad i = 1, 2..N, t = 1, 2..T_i \qquad (2)$$

Where additional variable, X_{it} is a $(1 \times L)$ vector of exogenous variables.

We adopted the GMM technique for Panel VAR estimation after controlling for panel specific fixed effects[10]. GMM style estimation provides instruments to control for potential endogeneity in the model, as proposed by (Holtz-Eakin et al., 1988). Panel specific fixed effect is removed using the first difference of variables in the model. Diagnostic checks are conducted before the final estimation of each model. Variable lags for the model specification are chosen on the basis of smallest values of MBIC, MAIC, and MQIC selection criterion (Andrews and Lu, 2001). Additionally, the stability of panel VAR estimates is checked through values of moduli of the companion matrix (Lutkepohl, 2005; Hamilton, 1994). Panel VAR model is considered to be stable if all moduli value of its companion matrix are less than one. It implies that the panel VAR system is invertible and estimation of impulse response function (IRF) is possible, which is our main interest here[11]. We present orthogonalized impulse response functions (OIRFs) that depict the response of one variable to unit shock or innovation in another variable of interest in the model while keeping all other shocks equal to zero.

We adopt the following procedure to obtain IRFs of the panel VAR system. First, variables in the panel VAR system are given a particular order in the system of equations. The identifying assumption of the ordering is that the variables that come earlier in the system impact following variable contemporaneously and also with a lag, whereas variable that comes later in the system impact the earlier variable only with a lag. In simpler words, the variables that come earlier in the model are considered relatively less endogenous (or relatively more exogenous in the system) and the ones that come later are more endogenous. The Cholesky decomposition method, for the variance-covariance matrix of residuals, is used for identification of the model through its transformation into a recursive framework and to obtain IRFs of a given model. We also computed their confidence intervals (CIs)[12].

To analyze the first objective of the paper, we estimate panel VARX model by ordering variables as EDS

[10]STATA package ‘pvar’ is used for panel VAR estimation here as provided by Abrigo and Love (2016).

[11]Since actual variance-covariance matrix of errors is most likely non-diagonal, it is not possible to isolate shocks to one of the variables in the model. These shocks can be isolated when residual are decomposed in such a manner that they get orthogonalized and it provides orthogonal impulse response function (OIRF) that we use for our analysis.

[12]Confidence intervals of IRFs are computed in two steps. First, the standard error of IRFs is computed using the standard error of panel VAR coefficients because the IRF matrix is constructed from the estimated panel VAR model. Second, it is used to generate confidence intervals with the Monte Carlo simulation technique. Using this method, we generate 5th and 95th percentiles of this distribution to obtain a confidence interval (CI) for the impulse response of our models.

or CBL, inflation, IIP growth rate, percent change in the exchange rate and yield spread for pre and post GFC period[13]. VIX is added as an exogenous variable to capture global risk uncertainty and its possible impact on the debt flows to EMEs. In this specification, we assume that EDS or CBL was a least endogenous variable in this system and affected inflation, IIP growth rate, exchange rate and yield spread contemporaneously, whereas latter affected former only with a lag. Yield spread, an indicator of macroeconomic risk, is the most endogenous variable in the system. In the model, it affects all another variable with a lag and simultaneously influenced by all other variables[14].

We believe the assumption for this ordering is plausible for three reasons. First, EDF (EDS or CBL) are largely influenced by global liquidity conditions and real interest rates in advanced economies while the role of domestic factors is very limited (Fernandez-Arias, 1996; Byrne and Fiess, 2016). The relatively larger role of external factors to determine external financial flows makes its components the least endogenous variable in the panel VAR system. Second, the exchange rate is relatively more endogenous because it faces direct appreciation pressure from these flows and therefore it is placed second in the panel VAR system of equations. Similar reasoning is applied to inflation and IIP growth rate. Last, the yield spread is expected to capture all available information in the economy. It therefore becomes the most endogenous variable in the system.

We take yield spread and exchange rate as a proxy for macroeconomic risk due to the following reason. Higher debt inflows put pressure on yield spread to become narrow and exchange rate to appreciate. If yield spread and exchange rate become highly sensitive to EDS and CBL shocks in a particular phase, it is possible that an EMEs might face rapidly widening yield spread and currency depreciation in case of negative shocks (debt flow reversal), which may further result in financial instability and economic slowdown. Such scenarios are possible if global liquidity reversal occurs from EMEs after recovery of advanced economies (Bems et al., 2016).

We estimate four Panel VAR models in this section. First two models analyze the impact of CBL shocks on macroeconomic risk. IRFs depicting the response of exchange rate and yield spread to the shock of CBL flows pre and post GFC are provided. We repeat this exercise for EDS flows also. We hypothesize that positive shocks in CBL or EDS would put appreciation pressure on the exchange rate and compress the yield spread. IRFs are expected to present a differential impact of CBL and EDS shocks during pre and post global financial crisis. If EMEs are too sensitive to a particular debt flow shock post-crisis compared to earlier that would indicate these economies are exposed to larger financial instability risks in the face of negative shocks to that debt flow.

The second question in this paper is explored with the same method with sample EMEs categorized into high and low level of EDF, EDS, and CBL[15]. The exogenous variable in the model is the time dummy for post-GFC and VIX. We use the time dummy to control for external shocks faced by EMEs during

[13] We analyze how different channels of EDF present macroeconomic risk to EME pre and post GFC.

[14] We choose AIC criterion to determine a significant number of lags for the model and find one lag to be significant.

[15] Second objective of the paper is to explore how heterogeneous level of total EDF and its different components, present differential macroeconomic stability risks to EMEs.

this period and VIX to capture global uncertainty. Rest of the model specification is given, by ordering the variables as earlier: EDF/EDS/CBL, inflation, IIP growth rate, exchange rate, yield spread. We estimate six panel VAR models in this section. First, two models are estimated to examine the response of exchange rate and yield to a unit positive shock in EDF flows for EMEs under high and low level of EDF. Four IRFs are presented in the results section to analyze this case. We repeat this exercise for EMEs with high and low level of EDS and CBL flows. In this case, we hypothesize that EMEs with high and low level of EDS or CBL face a differential impact on the exchange rate and yield spread due to positive shock in EDS or CBL respectively. It is expected that countries with a higher volume of EDF/EDS/CBL may experience relatively larger pressure on their exchange rate and yield spread compared to countries with its lower volume. If that is the case, we hypothesize that large inflows of a particular kind of debt (EDS or CBL) expose EMEs to larger macroeconomic risk.

4 Results

Diagnostic checks for each panel VAR model give first-order panel VAR model as the preferred estimation model and show it to be a stable system[16]. In the following subsections, we present relevant IRF graphs for each model discussed above.

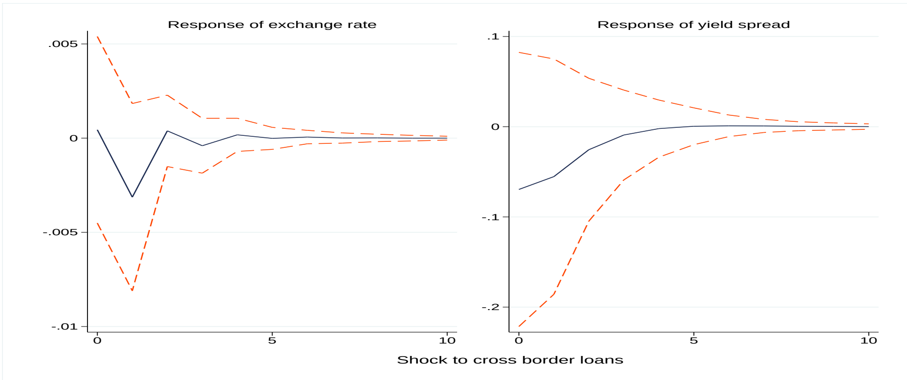
4.1 Channels of EDF flows and macroeconomic risks: Pre and post GFC (2008)

As discussed in the previous section, our intention here is to analyze how CBL and EDS flows pose challenges to macroeconomic stability in EMEs during pre and post GFC. Since CBL and EDS flows are structurally different and respond to distinct factors pre and post-financial crisis (2008), they are predicted to impact macroeconomic factors differently.

Figures 4-5 illustrate the reaction of key macroeconomic risk indicators to a unit shock in CBL flows during pre and post GFC. The response of exchange rate and yield spread to unit shock in CBL pre-crisis remain insignificant. However, the risk indicators become significantly responsive to CBL shock post-crisis. A positive shock in CBL flows reduces yield spread and exchange rate on impact. Therefore, EMEs seem to have become sensitive to CBL shock post-GFC. This result is in line with CBL flows trend toward EMEs as shown in Figure 3 where EMEs observed relatively calmer financial markets pre-GFC, whereas it becomes highly volatile during post-GFC and QE taper announcement. During the steady phase of CBL flows, its effect on the exchange rate and yield spread seems to have remained moderate. This trend changed post-GFC and CBL shock presented large macroeconomic pressure in the form of exchange rate pressure and yield spread compression during the volatile phase.

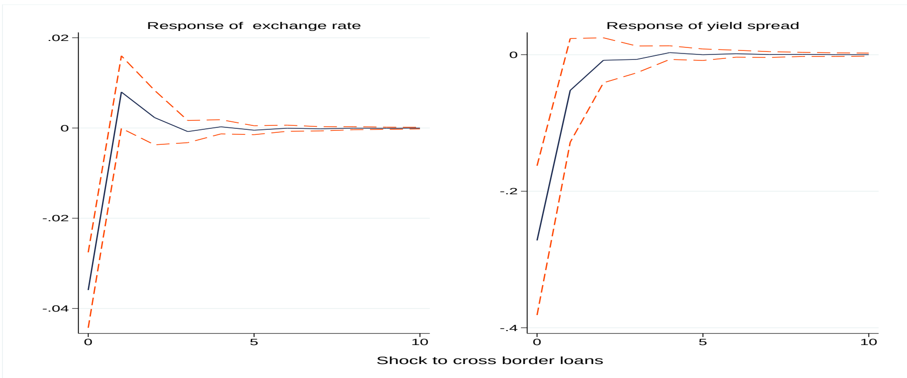
[16]See appendix for test results of diagnostic checks (lag selection criterion, system stability, unit root, and over-identification test) for each model.

Figure 4: Panel VAR IRFs for CBL (Pre GFC)



Note: Figure 4 shows the response of key macroeconomic risk indicators, exchange rate and yield spread, to a unit shock in CBL flows pre GFC. We capture it through orthogonal impulse response function of panel VAR. Grey line shows the responses of the variable and red line represent the 5th and 95th percentile of confidence interval band of the IRFs. The response of risk indicators remains insignificant in this case that suggests that unit shock in CBL flows did not affect macroeconomic risk during pre-GFC.

Figure 5: Panel VAR IRFs for CBL (Post GFC)

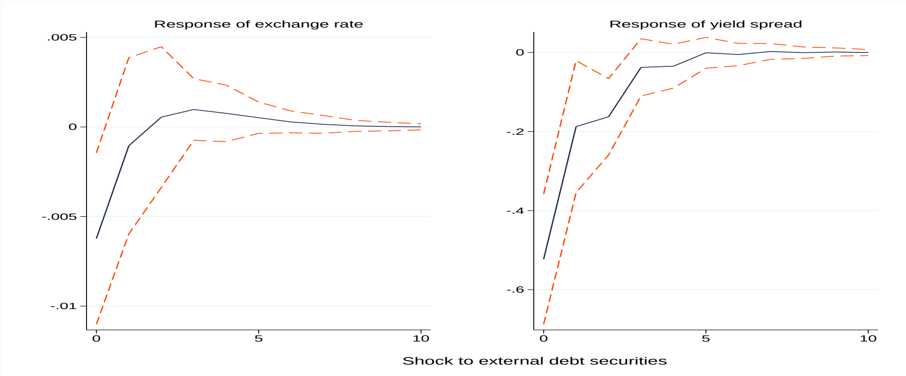


Note: Figure 5 shows the response of key macroeconomic risk indicators, exchange rate and yield spread, to a unit shock in CBL flows post-GFC. We capture it through orthogonal impulse response function of panel VAR. Grey line shows the responses of the variable and red line represent the 5th and 95th percentile of confidence interval band of the IRFs. IRFs show that exchange rate and yield spread are highly sensitive to a unit shock in CBL flows post-GFC. In other words, macroeconomic risk indicators became highly sensitive to the shocks to cross border loans in this period.

In contrast, we find that unit shock in EDS significantly decreases exchange rate and yield spread during both the periods (figures 6 and 7). Response of yield spread is higher during post GFC relative to the pre GFC period. Unlike CBL flows, EDS flows present notable macroeconomic risks in EMEs during both the periods and relatively higher risk post-GFC. These IRFs further indicate that the higher exchange rate pressure due to EDS shock post-GFC reflects appreciating pressure on the EME's currency due to huge EDS inflows in the second phase of global liquidity. This currency appreciation could be attributed to higher bond yield and looser regulation in EMEs that potentially incentivized huge EDS flows in these economies and as a result of which exchange rate pressure built up. It is reflected through IRFs shown in

Figure 7. Responses of EMEs currencies intensified post-crisis due to sudden acceleration of such flows.

Figure 6: Panel VAR IRFs for EDS (Pre GFC)

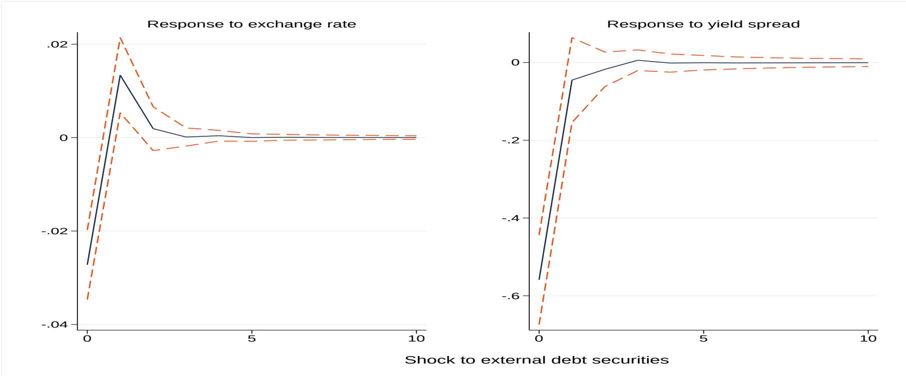


Note: Figure 6 shows the response of key macroeconomic risk indicators, exchange rate and yield spread, to a unit shock in CBL flows pre GFC. We capture it through orthogonal impulse response function of panel VAR. Grey line shows the responses of the variable and red line represent the 5th and 95th percentile of confidence interval band of the IRFs. IRFs show that EMEs observe significant yield spread compression and exchange rate pressure to a unit shock in EDS flow pre-GFC.

The results support our hypothesis, which is that EDS and CBL flows present differential risk pre and post GFC. Key Macroeconomic risk indicator, yield spread, is unresponsive to CBL shock particularly during pre GFC which effectively changes post GFC. Our results are complementary to dynamics of CBL flows which were typically stable pre-GFC but decelerated and became volatile post-GFC (figure 3). By contrast, it is not the case with EDS shock. The strong yield spread compression and exchange rate pressure due to the EDS shock during pre and post GFC suggest that EMEs are particularly sensitive to such flows and exposed to bigger risks due to their short term and volatile nature.

This result also indicates that EMEs' micro and macro-prudential regulations, which are implemented to reduce the risk attached to these flows, may not be entirely effective to stem the sudden and large spillover of external shocks originated from advanced economies.

Figure 7: Panel VAR IRFs for EDS (Post GFC)



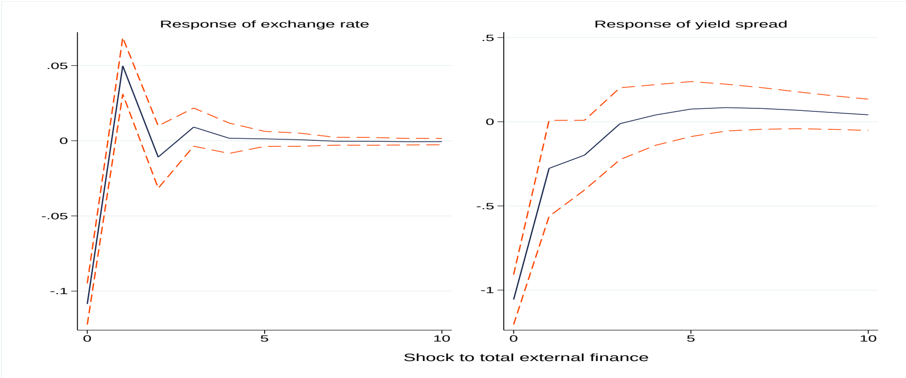
Note: Figure 7 shows the response of key macroeconomic risk indicators, exchange rate and yield spread, to a unit shock in CBL flows pre GFC. We capture it through orthogonal impulse response function of panel VAR. Grey line shows the responses of the variable and red line represent the 5th and 95th percentile of confidence interval band of the IRFs. IRFs here show that EMEs observe significant and relatively larger yield spread compression and exchange rate pressure to a unit shock in EDS flows post GFC period compared to pre-GFC period.

4.2 Volume of EDF/EDS/CBL flows and macroeconomic risks

We next turn to the association between the volume of EDF (its components) and macroeconomic stability risk in emerging economies. Figure 8-13 display the results for EMEs with high and low level of EDF, CBL, and EDS respectively.

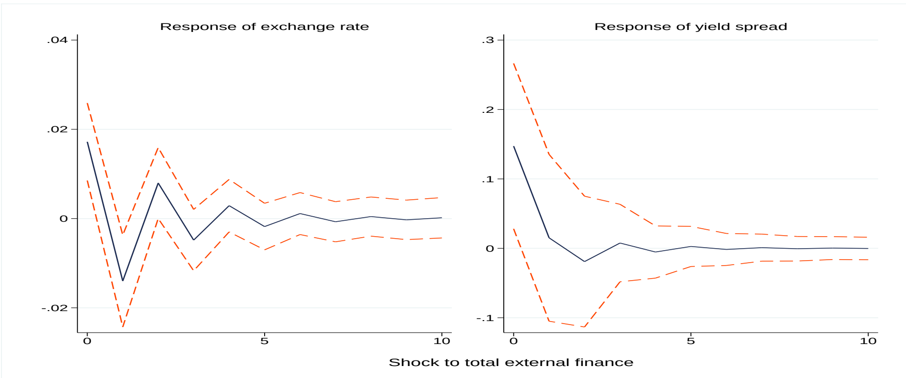
Figures 8 shows that a unit shock in EDF puts large and significantly negative pressure on the exchange rate and yield spread in EMEs with high level of EDF. The impact remains insignificant for EMEs with low level of EDF flows (figure 9). These results implies larger EDF flows in sample countries exposes them to significant macroeconomic risks. Such EMEs might need to put in place stronger and more effective countercyclical measure to reduce negative spillover in case of EDF outflows.

Figure 8: Panel VAR IRFs for high EDF EMEs



Note: Figure 8 shows the response of key macroeconomic risk indicators, exchange rate and yield spread, to a unit shock EDF flows for EMEs with high level of EDF. We capture it through orthogonal impulse response function of panel VAR. Grey line shows the response of the variables and red line represent the 5th and 95th percentile of confidence interval band of the IRFs. We observe that risk indicators in these EMEs are highly sensitive to unit shock in EDF flows.

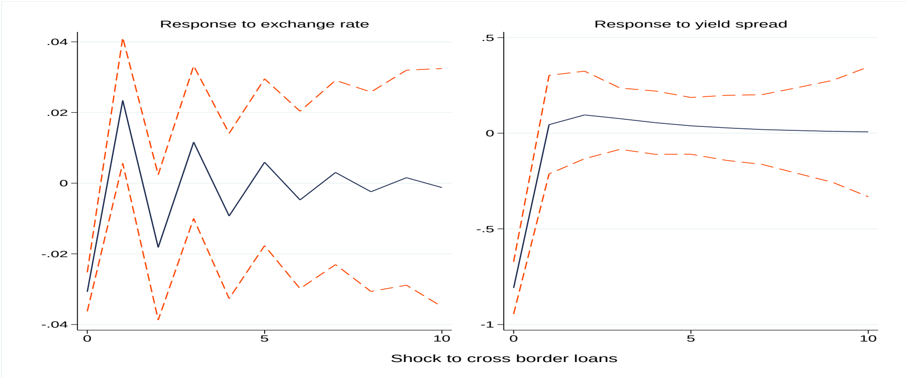
Figure 9: Panel VAR IRFs for low EDF EMEs



Note: Figure 9 shows the response of key macroeconomic risk indicators, exchange rate and yield spread, to a unit shock EDF flows for EMEs with low level of EDF. We capture it through orthogonal impulse response function of panel VAR. Grey line shows the response of the variables and red line represent the 5th and 95th percentile of confidence interval band of the IRFs. IRFs show that the response of risk indicators is insignificant to an EDF shock.

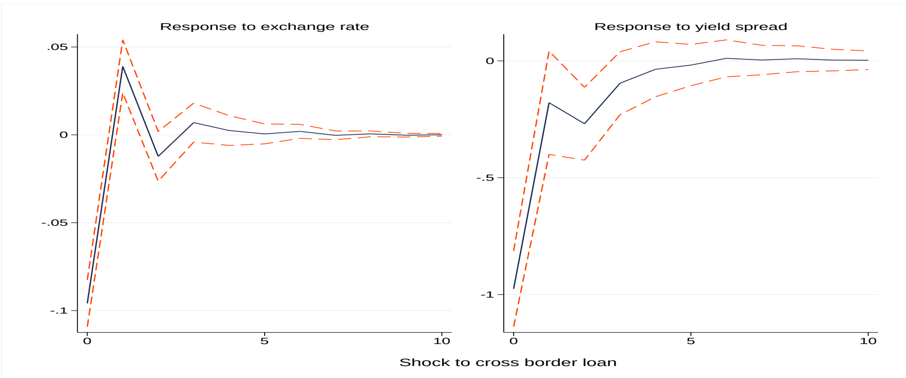
Further, at the compositional level of EDF, we observe that EMEs with high and low level of CBL face the similar level of yield spread compression to the CBL shock (figures 10 and 11). It suggests that the volume of CBL flows does not represent a distinct macroeconomic risk on the EMEs. However, EMEs with low level of CBL face larger exchange rate pressure.

Figure 10: Panel VAR IRFs for high CBL EMEs



Note: Figure 10 shows the response of key macroeconomic risk indicators, exchange rate and yield spread, to a unit shock EDF flows for EMEs with high level of CBL flows. We capture it through orthogonal impulse responses function of panel VAR. Grey line shows the response of the variables and red line represent the 5th and 95th percentile of confidence interval band of the IRFs. We observe that significant yield spread compression to a unit CBL shock which shows that EMEs with high level of CBL remain sensitive to shocks cross border flows.

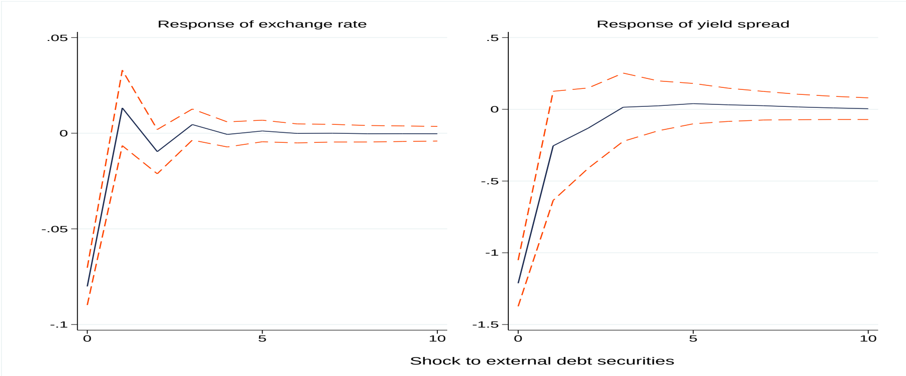
Figure 11: Panel VAR IRFs for low CBL EMEs



Note: Figure 11 shows the response of key macroeconomic risk indicators, exchange rate and yield spread, to a unit shock EDF flows for EMEs with low level of CBL flows. We capture it through orthogonal impulse response function of panel VAR. Grey line shows the response of the variables and red line represent the 5th and 95th percentile of confidence interval band of the IRFs. We observe the similar response of yield spread to shock in CBLs flows which indicate that CBL flows represent a macroeconomic risk to the EMEs.

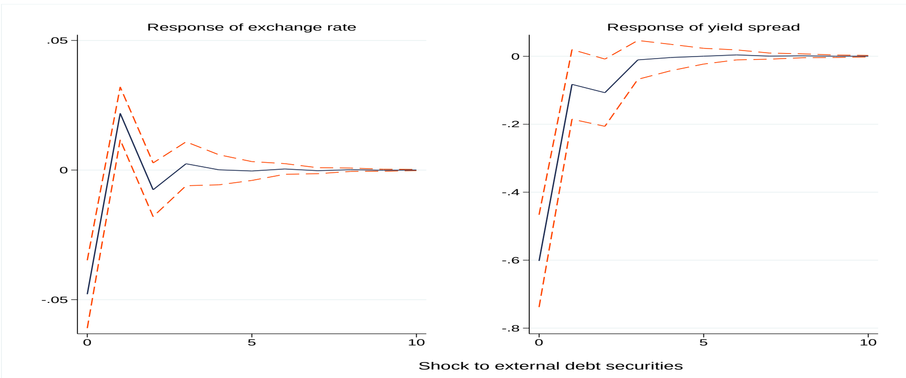
On the other hand, EMEs with high level of EDS observe larger yield spread compression and exchange rate pressure to EDS shock compared to EMEs with low level of EDS (figures 12-13). The IRFs reflect that EMEs with high level of EDS face macroeconomic stability risk through high yield spread and exchange rate sensitivity to the EDS shock. It also suggests that EDS flows is an important and dominant channel of EDF flows to affect macroeconomic risk scenarios in EMEs. This result has important implication because EDS flows have substantially increased in emerging economies particularly post-crisis and its potential volatility due to global liquidity reversal is more likely to pose a threat to their macroeconomic stability.

Figure 12: Panel VAR IRFs for high EDS EMEs



Note: Figure 12 shows the response of key macroeconomic risk indicators, exchange rate and yield spread, to a unit shock EDF flows for EMEs with high level of EDS flows. We capture it through orthogonal impulse response function of panel VAR. Grey line shows the response of the variables and red line represent the 5th and 95th percentile of confidence interval band of the IRFs. It points out that EMEs with high level of EDS observe relatively higher sensitivity of risk indicators to an EDS shock compared to EMEs with high level of CBL flows. Further, the exchange rate is highly sensitive to the shock in this case.

Figure 13: Panel VAR IRFs for low EDS EMEs



Note: Figure 13 shows the response of key macroeconomic risk indicators, exchange rate and yield spread, to a unit shock EDF flows for EMEs with low level of EDS flows. We capture it through orthogonal impulse response function of panel VAR. Grey line shows the responses of the variable and red line represent the 5th and 95th percentile of confidence interval band of the IRFs. It points out that EMEs with low level of EDS observe significant but relatively lower sensitivity of macroeconomic risk indicators to EDS shocks.

5 Concluding remarks

In this paper, we provide important empirical evidence on the exposure of emerging market economies to macroeconomic risks emanating from shocks to external debt financing flows. We use the panel vector autoregression method to explore this relationship for 10 major emerging economies over the period 2000-2017.

We analyze two key questions here: First, we look into whether different channels of EDF flows (primarily EDS and CBL flows) pose macroeconomic instability risks to EMEs pre and post GFC. This is an important issue in the context of EMEs since EDS flows has significantly picked up post-GFC, whereas CBL flows remained subdued during this period. EDS flows are typically transient in nature that makes it relatively riskier compared to CBL flows. We analyze this issue to ascertain whether EDS flows and its sudden movement can have wider repercussions for EMEs. Second, we question whether EMEs with the heterogeneous volume of EDF and the components of EDF are exposed to differential financial stability risk in case of external shocks. Results will suggest whether EME policymakers should encourage or discourage a particular kind of EDF flow in the post GFC era and bring changes in regulatory toolkit to manage associated risks.

We find that macroeconomic risk as indicated by compression of yield spreads and pressure on the exchange rate are more in response to shock in EDS flows compared to CBL flows. This response is consistently significant in the periods before and after the 2008 Global Financial Crisis. Further, we find that emerging economies with higher existing volume of external debt securities face relatively larger macroeconomic risks in the event of adverse shocks which is not the case with cross border loans. This highlights the importance of distinguishing between the various forms of external debt financing as opposed to treating it as a single category of capital inflow.

Our results have significant implications for emerging economies' macroeconomic stability especially in the era of increased foreign investor participation in their bond markets in the aftermath of the 2008 crisis. It poses new challenges for emerging economies in the event of global liquidity reversals as economic recovery of advanced economies leads to interest rate normalization. Our analysis highlights the need for policymakers to build up an efficient set of macro and micro-prudential regulations, which will enable them to effectively deal with the adverse consequences of shocks to external debt financing.

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Appendix

A Diagnostic test results

Channels of EDF flows and macroeconomic risks: Pre and post GFC (2008)

A.1 EDS

A.1.1 Pre-crisis

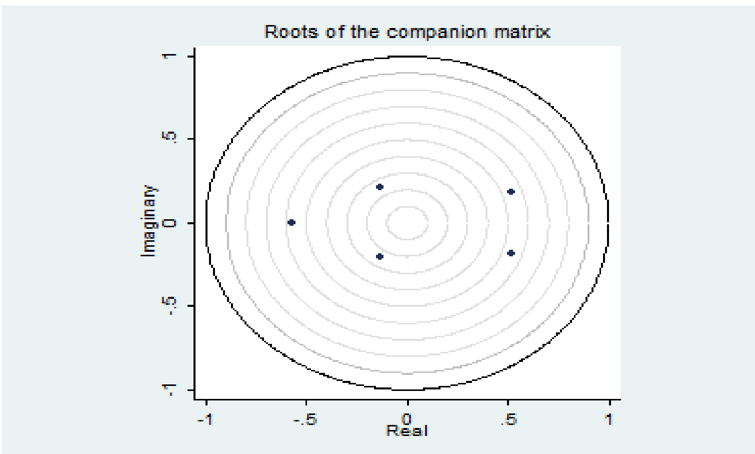
Table 6: Lag selection criterion

	MBIC	MAIC	MQIC
lag1	-316.28	-78.07	-174.68
lag2	-213.47	-54.67	-119.07
lag3	-108.98	-29.58	-61.78

Table 7: Unit root test (pVAR satisfies stability condition)

	Eigenv real	Eigenv imag	Modulus
1	-.57	0	.57
2	.52	.18	.55
3	.52	-.18	.55
4	-.14	.21	.25
5	-.14	-.21	.25

Figure 14: Plot of Panel VAR stability (roots are inside the circle)



A.1.2 Post-crisis

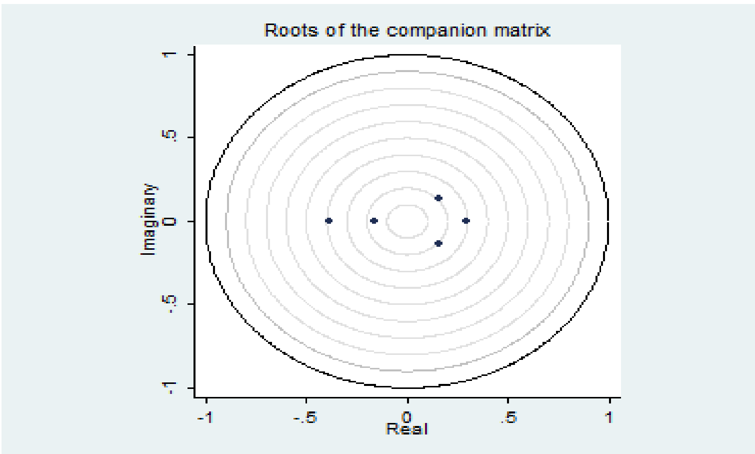
Table 8: Lag selection criterion

	MBIC	MAIC	MQIC
lag1	-349.42	-70.4	-182
lag2	-239	-52.98	-127.39
lag3	-130.14	-37.13	-74.34

Table 9: Unit root test (pVAR satisfies stability condition)

	Eigenv real	Eigenv imag	Modulus
1	-.39	0	.39
2	-.17	0	.17
3	.16	.14	.21
4	.16	-.14	.21
5	.3	0	.3

Figure 15: Plot of Panel VAR stability (roots are inside the circle)



A.2 CBL

A.2.1 Pre-crisis

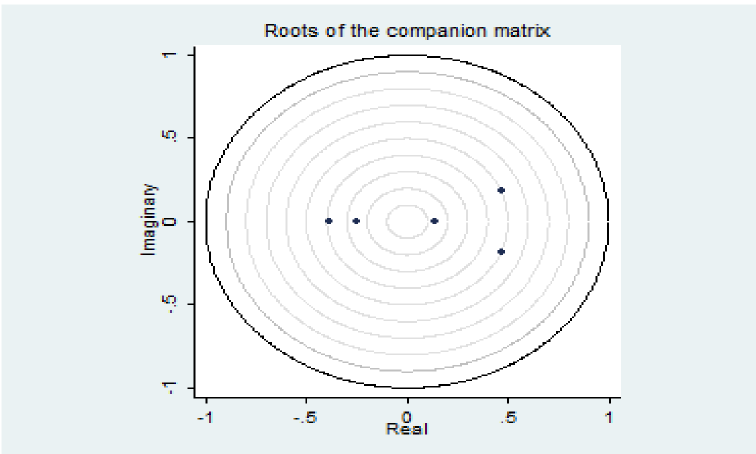
Table 10: Lag selection criterion

	MBIC	MAIC	MQIC
lag1	-307.44	-69.23	-165.84
lag2	-213.18	-54.37	-118.78
lag3	-113.77	-34.36	-66.56

Table 11: Unit root test (pVAR satisfies stability condition)

	Eigenv real	Eigenv imag	Modulus
1	.47	.19	.5
2	.47	-.19	.5
3	.14	0	.14
4	-.39	0	.39
5	-.25	0	.25

Figure 16: Plot of Panel VAR stability (roots are inside the circle)



A.2.2 Post-crisis

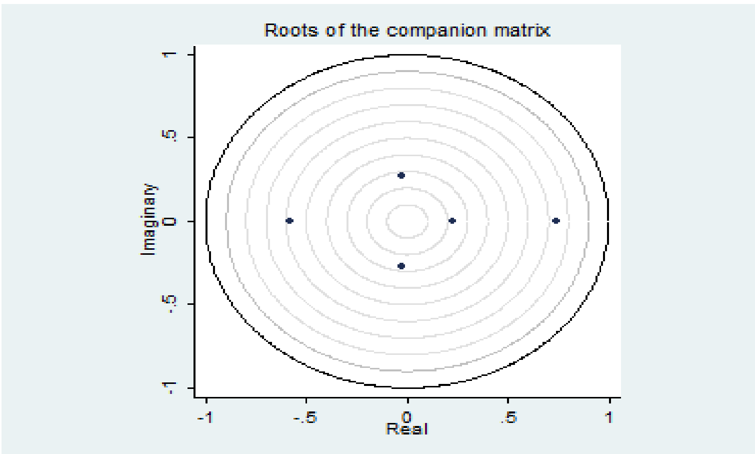
Table 12: Lag selection criterion

	MBIC	MAIC	MQIC
lag1	-345.81	-66.78	-178.39
lag2	-245.38	-59.37	-133.77
lag3	-134.38	-41.37	-78.57

Table 13: Unit root test (pVAR satisfies stability condition)

	Eigenv real	Eigenv imag	Modulus
1	-.58	0	.58
2	.74	0	.74
3	.23	0	.23
4	-.02	.27	.27
5	-.02	-.27	.27

Figure 17: Plot of Panel VAR stability (roots are inside the circle)



B Diagnostic test results

Volume of EDF/EDS/CBL flows and macroeconomic risks

B.1 EMEs with high EDF

Table 14: Lag selection criterion

	MBIC	MAIC	MQIC
lag1	-301.83	-30.84	-139.61
lag2	-217.29	-36.63	-109.14
lag3	-115.73	-25.4	-61.66

Table 15: Unit root test (pVAR satisfies stability condition)

	Eigenv real	Eigenv imag	Modulus
1	-.57	0	.57
2	-.13	0	.13
3	.66	.22	.7
4	.66	-.22	.7
5	.45	0	.45

Figure 18: Plot of Panel VAR stability (roots are inside the circle)

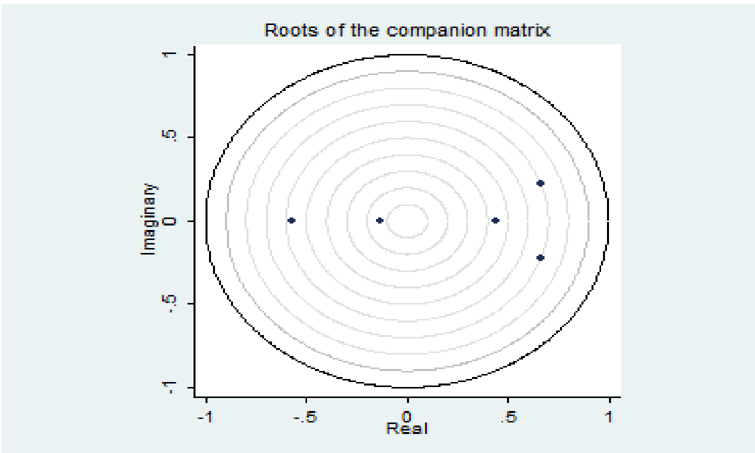


Table 16: Lag selection criterion

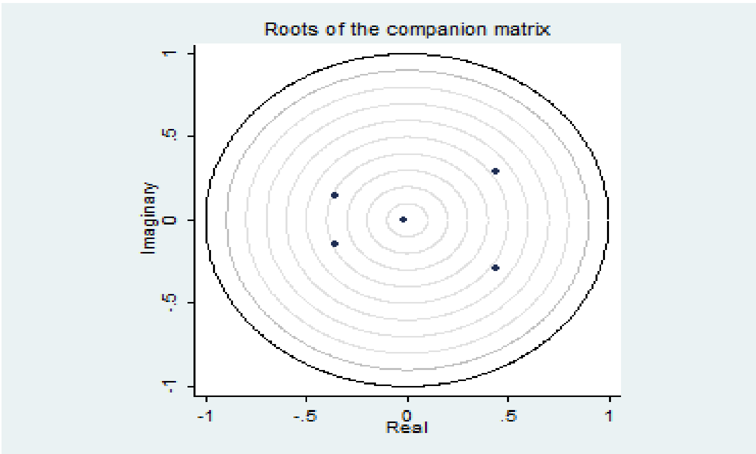
	MBIC	MAIC	MQIC
lag1	-336.72	-67.39	-175.57
lag2	-236.62	-57.07	-129.19
lag3	-130.26	-40.48	-76.54

Table 17: Unit root test (pVAR satisfies stability condition)

	Eigenv real	Eigenv imag	Modulus
1	-.36	.14	.39
2	-.36	-.14	.39
3	.44	.29	.53
4	.44	-.29	.53
5	-.02	0	.02

B.2 EMEs with low EDF

Figure 19: Plot of Panel VAR stability (roots are inside the circle)



B.3 EMEs with high EDS

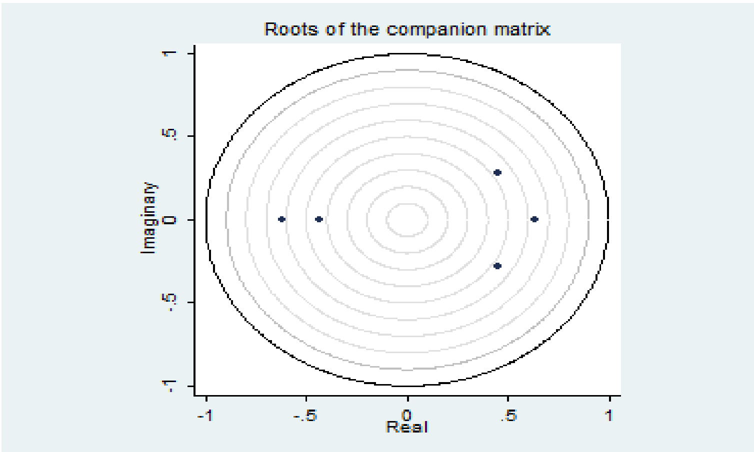
Table 18: Lag selection criterion

	MBIC	MAIC	MQIC
lag1	-303.1	-32.11	-140.88
lag2	-210.55	-29.9	-102.41
lag3	-119.06	-28.73	-64.99

Table 19: Unit root test (pVAR satisfies stability condition)

	Eigenv real	Eigenv imag	Modulus
1	-.62	0	.62
2	-.43	0	.43
3	.45	.28	.53
4	.45	-.28	.53
5	.64	0	.64

Figure 20: Plot of Panel VAR stability (roots are inside the circle)



B.4 EMEs with low EDS

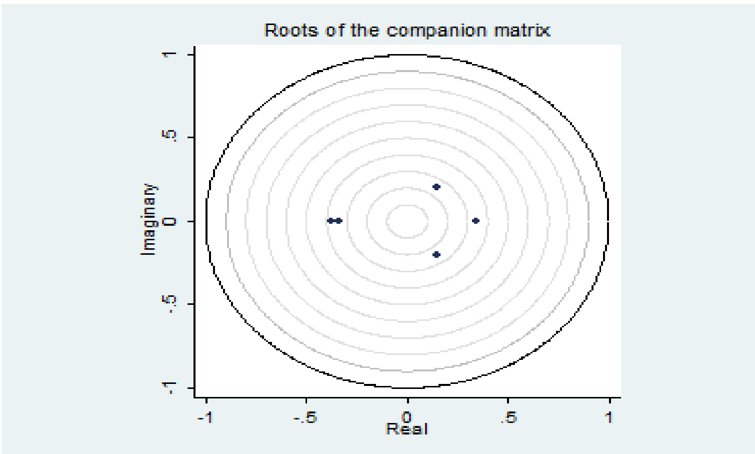
Table 20: Lag selection criterion

	MBIC	MAIC	MQIC
lag1	-335.09	-65.77	-173.94
lag2	-229.91	-50.36	-122.48
lag3	-127.03	-37.26	-73.32

Table 21: Unit root test (pVAR satisfies stability condition)

	Eigenv real	Eigenv imag	Modulus
1	.34	0	.34
2	.15	.2	.25
3	.15	-.2	.25
4	-.38	0	.38
5	-.33	0	.33

Figure 21: Plot of Panel VAR stability (roots are inside the circle)



B.5 EMEs with high CBL

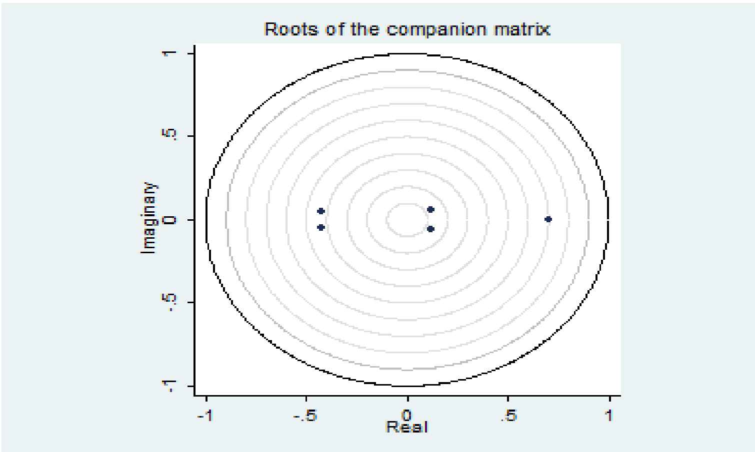
Table 22: Lag selection criterion

	MBIC	MAIC	MQIC
lag1	-310.05	-35.85	-145.76
lag2	-229.19	-46.39	-119.66
lag3	-121.91	-30.51	-67.15

Table 23: Unit root test (pVAR satisfies stability condition)

	Eigenv real	Eigenv imag	Modulus
1	.7	0	.7
2	-.43	.05	.43
3	-.43	-.05	.43
4	.12	.06	.14
5	.12	-.06	.14

Figure 22: Plot of Panel VAR stability (roots are inside the circle)



B.6 EMEs with low CBL

Table 24: Lag selection criterion

	MBIC	MAIC	MQIC
lag1	-225.52	-55.36	-123.8
lag2	-160.55	-47.1	-92.73
lag3	-81.05	-24.32	-47.14

Table 25: Unit root test (pVAR satisfies stability condition)

	Eigenv real	Eigenv imag	Modulus
1	-.52	.14	.54
2	-.52	-.14	.54
3	.68	.31	.75
4	.68	-.31	.75
5	.74	0	.74

Figure 23: Plot of Panel VAR stability (roots are inside the circle)