Global Spillovers, Financial Fragility, and International Reserve Accumulation in Emerging Market Economies: A Post-Keynesian Perspective

Abstract

We examine the determinants of international reserve accumulation in EMEs by analysing how spillovers from EMEs (peripheral economies) and the United States(core economy) influence their reserve-holding dynamics. Using a BGVAR framework with SSVS priors, the analysis extends the existing literature by incorporating cross-country spillovers via trade and financial linkages. The findings show that foreign factors, particularly international reserves, exchange rates, and equity prices of other economies, significantly impact reserve holdings. The GFEVD results indicate that the influence of foreign variables on international reserves grows stronger over the long term, while different patterns of channel dominance appear across EMEs. Additionally, the results confirm that the United States continues to have a substantial and persistent effect on reserve accumulation in EMEs

Keywords: BGVAR, International Reserves, EMEs, US

JEL Codes :F02,F15,F31

1.0 Introduction

EMEs have taken centre stage in the global economy in the past two decades. They currently account 51% of global output and have emerged as a key driver of global growth due to their rapid growth rates(World Bank,2025). The EMEs now have considerably better trade and financial linkages, which have accelerated the trend of global integration(Prasad & Kose,2011). The rapid growth of economic and financial ties among EMEs is noteworthy, as trade and financial flows among these nations now make up an increasing portion of their corresponding total cross-border movements(Abdel-Latif & Popescu, 2025; Huidrom et al,2020; Fukuda &Tanaka,2020). Due to the economic and financial spillovers brought about by this rise, global policymakers now need a greater understanding of the dynamics. Given the changing economic landscape, understanding the spillovers among EMEs has become increasingly important. Prasad & Kose(2011) argue that the trade and financial linkages between EMEs and Advanced Economies are becoming stronger, accelerating the global integration process. The rapid integration of the EMEs has led to frequent financial crises and volatile capital flows within the economies. The EMEs responded to speculative and unstable capital flows by accumulating international reserves.

The global holdings of international reserves have risen rapidly in the past two decades, and this rise has been particularly prominent in EMEs. In addition, a standard reserve holding model does not foresee the recent record pace of reserve buildup in emerging nations (IMF, 2003). Macroeconomic management heavily relies on managing a nation's liquid assets to support present and future international transactions, due to the growing financial liberalisation and openness to cross-border transactions that began in the early 1990s. A sovereign's ability to access global financial markets determines the appropriate quantity of reserves and liquidity(Choi et al,2009). As mentioned earlier, in recent years, currency and/or financial crises accompanied by reversals in capital flows have increased in frequency and severity

(Eichengreen & Adalet, 2005). Due to the occurrences of crises, the greater financial interconnectedness is becoming increasingly susceptible to internal and external contagion. As a reaction to this, the central banks of EMEs have amassed reserves to protect against unforeseen circumstances, the bunching of external debt maturities, or other shocks that might have an impact on the local economy and foreign exchange market. This trend has mostly benefited the USA, exposing the US dollar's exploitative nature as a global currency (Painceira,2021). Fritz et al. (2022), in their study on financialization among EMEs, point out that most of the EMEs have accumulated huge levels of international reserves to different degrees as a response to the rising global uncertainties.

Thus, in the global scenario, the individual economies in the world are interlinked through resource sharing, cross-border trade activities, political and technological linkages, and capital flow movements (Chudik & Pesaran,2016; Boeck et al.,2022; Garratt et al., 2013; Kose et al.,2003; and Di Mauro & Pesaran,2013). This trend has led to increased interdependencies between the economies through multiple channels. Even after allowing for these interdependencies, there might still be some residual interdependencies due to some unobserved interactions and spillover effects that have not been considered. It is therefore important to take account of these interdependencies in such an economically and financially integrated world (Gunduz et al,2025).

In this context, we argue that the international reserves accumulation in EMEs is shaped by both domestic (endogenous) and global (exogenous) factors. The existing studies have largely overlooked the interconnected nature of these economies, especially the role of cross-border spillovers in shaping reserve accumulation strategies. This is a critical gap in the literature, as EMEs are increasingly embedded in the global financial system and are subject to shocks transmitted through trade and financial channels. Given the structural subordination of EMEs in the international financial hierarchy and the hegemony of the dollar (de Paula et al., 2022;

Kaltenbrunner & Painceira, 2017), it is important to adopt a modelling framework that can capture these interlinkages. To address this gap, this study adds to the existing literature of determinants of EMEs by employing the Bayesian Global Vector Autoregressive (BGVAR) model proposed by Feldkircher &Huber(2016), which enables us to examine the drivers and channels of international reserves. This framework sheds light on a comprehensive analysis of drivers of international reserves, focusing on EMEs and estimates how the shocks from a dominant economy, the US, transmit to the EMEs' international reserves through trade and financial linkages.

Our analysis supports four other research strands and adds to the existing literature in the following ways;

Firstly, it advances the literature on the determinants of international reserves by explicitly incorporating the dynamics of global economic integration and cross-border spillovers. In contrast to earlier studies (e.g., Aizenman & Lee, 2007; Ghosh et al., 2012; Steiner, 2013), which treated economies as largely isolated units, the BGVAR framework models EMEs as part of a globally interconnected system. By integrating financial and trade linkages, the model offers a holistic view of the determinants of international reserves in EMEs by considering spillovers between economies, employing the BGVAR model. Secondly, the study pays particular attention to the role of the United States. Since the majority of EMEs hold reserves in US dollars, they are inherently exposed to volatility originating from the US economy. Following Ocampo (2001) and Kaltenbrunner & Painceira (2017), we examine how shocks emanating from the US transmit to EMEs' reserves via trade and financial flows, reinforcing the idea of financial subordination. Thirdly, we estimate two separate models to distinguish trade and financial linkages across countries. This separation of linkages is expected to provide deeper insights into the underlying channels and motives of reserve accumulation among EMEs; specifically, the mercantilist and precautionary motives. Finally, by capturing both

country-specific dynamics and cross-country interactions, this study sheds light on the interconnected nature of international reserve behaviour and offers important implications for policymakers in EMEs.

Following the introductory section, the rest of the paper is structured as follows. Section 2 presents a review of the literature. Section 3 explains the data and methodology part, and Section 4 discusses the empirical results. Section 5 concludes the paper.

2.0 Review of literature

This section provides an overview of the theoretical and empirical foundations underlying the study of international reserve accumulation. It is structured into two main parts. The first part outlines the theoretical underpinnings of reserve accumulation. The second part reviews the empirical evidence on the determinants of international reserves, summarising key cross-country and country-specific studies, as well as identifying their methodological limitations.

2.1 Theoretical underpinnings of International Reserves accumulation

There are mainly two important theories or motives that explain the international reserves accumulation of the economies: precautionary and mercantilist motives. The precautionary motive corresponds to the desire to hold reserves as a buffer against external vulnerabilities such as sudden capital outflows, terms-of-trade shocks, or exchange rate volatility. Similarly, the mercantilist motive parallels the speculative or strategic motive at the individual level, where reserves are used as an instrument to maintain export competitiveness and manage currency values in pursuit of long-term growth and stability. The existing literature investigated the determinants of international reserves mainly from this viewpoint. In their study, Ghosh et al. (2012) analysed the relative importance of two motives in EMEs to explain the massive accumulation of international reserves by taking current account and capital account shocks using an OLS model, arguing that no single explanation can account for the behaviour of all

countries at all times. One important limitation of their study is that, they do not account for trade and financial linkages between the economies and the spillover effects.

In the context of the mercantilist motive, several studies have identified positive relationships between trade and international reserve accumulation. In the context of Malaysia, Nor et al. (2008) found that both imports and exports positively influenced its reserve holdings. Similarly, Schröder (2017) and Lane & Milesi-Ferretti (2004) also found a positive association between real exchange rates and reserve levels, while Durdu et al. (2009) linked reserve accumulation to real exchange rate undervaluation. However, a common limitation across these studies is that they largely overlook the interconnected trade networks between economies that play a central role in shaping the mercantilist incentive to accumulate reserves.

On the other hand, a substantial body of literature has examined the precautionary motives behind international reserve accumulation. Empirical evidence indicates that precautionary motives exert a stronger influence on reserve accumulation than mercantilist considerations in emerging market economies(Aizenman & Lee,2007).In the case of Korea, Aizenman et al. (2017) show that shifts in reserve holdings following the Asian financial crisis were largely driven by precautionary factors and were positively associated with output growth, highlighting the self-insurance role of reserves. Similarly, Pina (2017) finds that global financial conditions also play a role, with higher global interest rates positively correlated with international reserve holdings. In addition, Nor et al. (2011) stress that a stronger current account balance contributes positively to reserve accumulation. Thus, the international reserve accumulation plays the role of self-insurance or precautionary savings due to the global uncertainties (Bianchi et al., 2016; Hur & Kondo, 2016; Jeanne, 2007). Equity prices are another important determinant of international reserve holdings, where many studies have not explored this linkage. Studies also support the existence of a relationship between stock prices and the foreign exchange market. According to the "Portfolio Balance Approach", a booming stock market attracts international

investors, thereby creating a demand for domestic currency and vice versa. This will lead to appreciation of the currency and central banks intervene by buying foreign currency, which adds to reserves(Ingalhalli et al.2016).Foo et al (2023) in their study highlight that the oil price shocks also affect the holdings of international reserves, where a sudden fall in oil prices can cause a decline in reserve holdings.

2.2 Empirical Evidence of Determinants of International Reserves

The empirical evidence reinforces the precautionary and mercantilist motives. Feldstein (1999) viewed reserves as insurance against sudden capital flow reversals but overlooked cross-country spillovers. Similarly, Jeanne & Rancière (2011) emphasised reserves as a safeguard against financial turbulence. The recent surge in the reserve accumulation can be attributed to crisis protection and global financial risks(Cabeza & De Gregorio,2019; Bussière et al., 2015) Aizenman & Marion (2002) identified trade size, exchange rate volatility, and political factors as key drivers. Steiner (2013) linked reserve buildup to capital market liberalization, while Delatte & Fouquau (2011) found U.S. external imbalances significantly impact EMEs' reserves.

There are numerous country-specific studies in this area, and they identify country-specific factors in determining the international reserves. The existing literature investigated the accumulation of international reserves mainly from the viewpoint of mercantilist and precautionary motives. In their study, Nor et al. (2008) found that imports and exports positively influenced the international reserves of Malaysia using the ARDL framework. In the context of China, Schröder (2017) found that China's growth in reserves is influenced by real exchange rates, and the undervaluation and distortion of foreign exchange market interventions, but they say both motives have their own role in their economy. Sethi & Jena (2020) in their paper analysed the determinants of Brazilian international reserves using ARDL

methodology. They used current account balance, Inflation, Exchange rate, Debt to GDP, real interest rate and GDP for the analysis. Results indicated that foreign exchange reserves Granger-cause the current account balance as a percentage of GDP (5% level of significance), while the reverse does not hold. In the Indian context.Prabheesh et al. (2007) studied the determinants of international reserves using cointegration, and they considered exchange rate, broad money to GDP, and interest rates as the major determinants. Similarly, Mishra & Sharma (2011) used the cointegration and VECM approaches to investigate the Indian reserve demand function as a result of the introduction of the time-series approach. They employed a Generalised Autoregressive Conditional Heteroskedasticity (GARCH) model of Bollerslev (1986). Additionally, their study differs from many previous studies in that it considers Foreign Portfolio Investment (FPI) and short-term external debt as potential factors influencing reserve demand. Banchuenvijit(2014) estimates major drivers of international reserves in Thailand using multiple regression with OLS and finds that trade balance, exchange rate, GDP, and propensity to import are the major variables determining the reserves accumulation.

While both the mercantilist and precautionary motives offer theoretical insights into the determinants of international reserve accumulation, much of the existing empirical literature tends to examine these motives in isolation, focusing primarily on domestic macroeconomic fundamentals such as current account balances, exchange rate regimes, or exposure to capital flow volatility. However, most studies do not adequately capture the role of cross-country interdependencies.External shocks such as shifts in monetary policy in advanced economies (e.g., US interest rate hikes) rarely affect countries in isolation. Instead, they propagate through trade and financial networks, generating spillover effects.

There are numerous studies that deal with the dominance of the United States in the global financial system and its impact on developing and emerging economies. Cohen(1998) discusses the dollar hegemony through the currency hierarchy structure. The currency hierarchy

highlights the problems faced by the currencies of peripheral economies(Orsi et al.,2020). The international investors consider the dollar a safe-haven asset to hold during times of uncertainty. During periods of uncertainty, international investors retreat to dollar-denominated assets, viewing EMEs as risky despite higher interest rates. This drives capital outflows from EMEs, prompting them to accumulate U.S. dollar reserves. (Kaltenbrunner & Painceira, 2017). These dynamics reflect the deep trade and financial linkages between EMEs and the U.S.

As we mentioned earlier, the econometric models considering countries as isolated entities may overlook crucial data for forecasting and counterfactual analysis. The Global Vector Autoregressive (GVAR) models, which use a global system of equations to evaluate the strength of cross-unit correlation, do not raise these issues (Chudik & Pesaran ,2016). The GVAR model has been extensively applied across macroeconomic and financial research. In the realm of monetary policy interdependence, studies such as Burriel &Galesi (2018), Hajek & Horvath (2017), Chen et al. (2017), Benecke et al. (2018), Colabella (2020), and Bi & Anwar (2016) employ GVAR methods to trace cross-country policy transmission. Similarly, GVAR has proven instrumental in analysing trade and external imbalances (Bussière et al., 2009; Bettendorf, 2017; Alam et al., 2023; Camarero et al., 2021) as well as credit shocks (Eickmeier & Ng, 2015; Bettendorf, 2019; Kishimba et al., 2024; Dees, 2016). Furthermore, the approach has been utilized to examine the impact and dynamics of debt crises (Konstantakis & Michaelides, 2014; Kempa & Khan, 2017; Colabella, 2021), capital flows (Boschi, 2021; Anaya et al., 2017), and fiscal policy spillovers (Ricci-Risquete et al., 2015; Attílio et al., 2023; Dragomirescu-Gaina and Philippas, 2015; Belke and Osowski, 2019; Caporale and Girard, 2013). The influence of policy uncertainty has also been explored using this framework (Han et al., 2016; Salisu et al., 2022; Tam, 2018). Beyond these, GVAR techniques have found broader applications in diverse areas of global macro-financial analysis (Salisu et al., 2022; Mirnezami et al., 2023).

However, the studies on determining the international reserves are very scarce in the spillover framework. The GVAR methodology suffers from overfitting and numerical stability (Boeck et al,2022). To address this issue, we are using a Bayesian version of GVAR, where the use of shrinkage priors will reduce the model uncertainty and accommodate non-linearities through stochastic volatility. It will also facilitate the impulse response functions and forecast error variance as well as conditional and unconditional forecasting. The major advantage of BGVAR model is that it has shrinkage priors, which can deal with the problem of over parametrisation and have been shown to be efficient for forecasting purposes (Huber,2016; Dovern et al.,2016).In order to obtain posterior probability distributions, we first update the prior mean using sample data, and these priors show the range of uncertainty surrounding that mean. As far as we are aware, only a few studies have applied the BGVAR framework in a cross-country scenario.Feldkircher&Huber(2016) analyse the international transmission of US monetary shocks on other economies using BGVAR. Onipede et al.(2022) study the impact of external shocks on small open economies through this framework, and they argue that this methodology deals with the problem of the curse of dimensionality.Vukovi´c et al.(2025) also utilise the BGVAR method for examining the transmission of shocks originating in the crypto market.

The existing studies primarily examined the determinants of reserves within the precautionary and mercantilist motives, emphasizing domestic fundamentals like current account balances, exchange rate volatility, and capital flow dynamics. While these approaches enhanced understanding of internal drivers, they largely neglected the increasingly interdependent structure of the global economy, where trade and financial linkages play a critical role in transmitting external shocks. The globalisation and financial integration have underscored the limitations of such models, particularly in capturing the spillover effects of shocks emanating from advanced economies, notably the United States. Recent advancements, notably GVAR and its Bayesian extension (BGVAR) frameworks, have addressed these shortcomings by

incorporating cross-country linkages, offering a comprehensive understanding of global macro-financial dynamics. However, applications of these models to the study of international reserves remain unaddressed, with most studies focusing on monetary, fiscal, or financial transmission channels rather than reserve dynamics. This gap highlights the need for an integrated framework that captures both precautionary and mercantilist motives within a global spillover context.

3.0 Data and Methodology

3.1 Data, Variables and Country Coverage

In this study, we use the GVAR dataset, which has 33 economies developed by Dees et al. (2007). This dataset is widely used in the macroeconomic and financial literature to study the spillover effects. Since our study context is EMEs, we have selected 13 EMEs: Argentina, Brazil, Chile, China, India, Indonesia, Malaysia, Mexico, Peru, the Philippines, South Africa, Thailand, and Turkey based on data availability for the period 1996Q1–2023Q3 (111 observations). This time period captures the major global and regional financial episodes such as the Asian Financial Crisis, the Global Financial Crisis, and the COVID-19 pandemic, along with phases of financial liberalisation. Thus, the chosen timeframe provides a comprehensive representation of structural shifts in global trade and finance that have influenced the reserve accumulation behaviour of EMEs. The dataset includes real GDP(y), inflation(dp), the real exchange rate(ep), interest rate(r), and real equity prices(eq). For the countries Brazil, China, Indonesia, Mexico, Turkey and Peru, the equity prices data are not available in the database. Thus, we have constructed the data using their equity indices, Bovespa, Shanghai Composite Index, Jakarta stock exchange Mexico, BIST 100,S&P Lima Index.We have also included oil prices(poil) as the global control variable. We add quarterly data on international reserves excluding gold(lnir) from International Financial Statistics (IFS). The variables are briefly

described in Table A1 in the appendix. We have not included the exchange rate for the US in the model. We construct foreign counterparts of the selected variables using trade and financial weights. Since we consider the shocks from advanced economies to the EMEs, we have taken the United States as the major advanced economy.

3.2Weights

As discussed, the major advantage of the GVAR or BGVAR framework is the construction of weakly exogenous variables through assigning weights, which quantifies the economies' trade and financial integration. Gross (2013) points out that these weights facilitate the interlinkage between the economies.

3.2.1Trade weights

Following Pesaran et al. (2004); Dees et al. (2007); Mohaddes & Raissi (2024), we construct weakly exogenous variables using bilateral trade weights. We are using the latest four - year average of IMF bilateral trade statistics (2016-2019) in contrast to earlier studies (Mohaddes & Raissi use the 2014-2016 period).The trade weights are computed by using the following formula

$$W_{ij} = \frac{BT_{ij,2016}+BT_{ij,2017}+BT_{ij,2018}+BT_{ij,2019}}{BT_{i,2016}+BT_{i,2017}+BT_{i,2018}+BT_{i,2019}}$$

where BT_{ij} is the bilateral trade between country i and country j during the year t and is estimated as the average of exports and imports. Here the with $w_{ii}= 0$; and $\sum_{j=1}^{N} wij = 1$. The trade matrix is given in the Supplementary file.

3.2.2 Financial weights

To capture financial integration among economies, we construct financial weights based on the weighing scheme of Eickmeier &Ng (2015). They employ IMF Coordinated Portfolio

Investment Survey-CIPS (Table 8) for capturing the financial linkages. The CPIS provides detailed information on each nation's overall portfolio investment asset positions, including debt instruments (bonds, notes, and money market instruments) and equity (shares and other equity) in other nations' financial markets. We construct the financial weights for the period from 2016 to 2019 to avoid time bias. The weights are calculated using the following formula

$$W_{iP} = \frac{PI_{ij,2016}+PI_{ij,2017}+PI_{ij,2018}+PI_{ij,2019}}{PI_{i,2016}+PI_{i,2017}+PI_{i,2018}+PI_{i,2019}}$$

where PI denotes the bilateral portfolio investment. The constructed financial matrix is given in the Supplementary file.

Fixed (time-invariant) trade and financial weights are used to ensure methodological consistency and stability within the BGVAR framework, as time-varying weights can introduce additional noise and complicate the interpretation of spillover effects. The four-year average (2016–2019) helps smooth short-term fluctuations and captures more structural and persistent economic linkages between countries. This approach also enhances comparability with existing literature, which predominantly relies on fixed weights. Importantly, the selected period excludes the COVID-19 years, thereby avoiding distortions arising from unprecedented disruptions in global trade and financial markets.

4.0 Methodology

The BGVAR modelling process has two steps. The first step focuses on specifying unit-specific models. The second stage integrates various models to create a global representation of the model. We assume a very general model with panel structure, where i= 1,….. ,N which shows unit i and N shows the total number of units. For each i, we assume that a k_i-dimensional vector of endogenous variables x_{it} with P lags. These variables are complemented with the contemporaneous and lagged exogenous variables x_{it}^* with k_i^* dimension.

In the BGVAR model, we also introduce pre-specified weights for accounting for bilateral linkages between the units. The weights w_{ij} satisfy the following two conditions

1.$W_{ii} = 0$

2. $x_{it}^* = \sum_{j=1}^{N} w_{ij} = 1$, the vector x_{it}^* represents the weighted average of the other units in the model. This is shown in the expression below

$$x_{it}^* = \sum_{j=1}^{N} w_{ij}\, x_{jt} \qquad (1)$$

Here we can assign equal weights for each element in x_{it}^* or different weights for different variables in the system.

The unit-specific model can be written as below

$$x_{it} = \beta_{i0} + \beta_{i1} t + \sum_{p=1}^{P} \theta_{ip} x_{it-j} + \sum_{q=0}^{Q} \tau_{ip} x_{it-j}^* + \varepsilon_{it} \qquad (2)$$

$$\varepsilon_{it} \sim N(0, \sum_{it})$$

Where β_{i0} and $\beta_{i1} t$ indicate the ki-dimensional coefficient vectors. These are linked with the deterministic component of the model, which has a trend and an intercept term. Next θ_{ij} where j = 1,……..,P denotes the $k_i \times k_i$ coefficient matrix associated with the lagged dependent variables. τ_{ip}(j=0,……Q) also denotes a matrix of coefficients with $k_i \times k_i^*$ dimension linked with the weakly exogenous variables in the system, which are x_{it}^* and ε_{it} is a Gaussian error vector with zero mean and a ki×ki covariance-variance matrix $\sum_{it}$. Since the estimation is unit by unit, ε_{it} and ε_{jt} are independent for all i,j, thus

$\sum_t = diag(\sum_{it}, \ldots\ldots\ldots\ldots \sum_{Nt})$ which is a block diagonal matrix. It also implies that any co-movement between x_{it} and x_{jt} is driven by the weakly exogenous variables x_{it}^*. For specifying the unit-specific model, we decompose $\sum_{it} = A_i D_{it} A_i^T$, where A_i is a lower triangular matrix

and D_{it} = diag($e^{di1,t}$, … … … … $e^{d_i k_{i,t}}$) with $d_{ij,t}$ following an AR(1) process. The next step is about stacking the estimated coefficients of the unit-specific models into the global system of the equations. Here we assume P= Q=1.This denotes the following expression

$$x_{it} = \beta_{i0} + \beta_{i1} t + \theta_{ip} x_{it-j} + \tau_{i0} x_{it}^{*} + \tau_{i1} x_{it-1}^{*} + \varepsilon_{it} \quad (3)$$

Based on this we can rewrite the unit-specific models in terms of global vector consisting of endogenous variables $x_t = (x_{1t,}^{T}$ … … … … … … … … … …., $x_{Nt,}^{T})^{T}$ where k dimension and where k = $\sum_{j=1}^{N} k_j$.

We also need a unit-specific link matrix W_i($k_i \times k$) and a selection matrix D_i ($k_i \times k$). The unit-specific link matrix uses the weights to construct the weakly exogenous variables x_{it}^{*}, and the selection matrix chooses the unit-specific variables from the global vector. This leads to$D_i\, x_t =$ $\beta_{i0} + \beta_{i1} t + \theta_{i1} D_i x_{t-1} + \tau_{i0} W_i x_t + \tau_{i1} W_i x_{t-1} + \varepsilon_{it}$, (Di $- \tau_{i0} W_i)\, x_t = \beta_{i0} + \beta_{i1} t +$ $(\theta_{i1} D_i + \tau_{i1} W_i)\, x_{t-1} + \varepsilon_{it}$

Where (Di $- \tau_{i0} W_i)\, x_t$ is M_i and $(\theta_{i1} D_i + \tau_{i1} W_i)$ is L_{i1}.When we do stack these observations for all countries taken in the model,it will lead to

$Mx_t = \beta_0 + \beta_1 t + Lx_{t-1} + \varepsilon_t$ where $\beta_0 = (\beta_{10,}^{T}$ … … … … … … … … … …., $\beta_{N0,}^{T})^{T}$,

where $\beta_1 = (\beta_{11,}^{T}$ … … … … … … … … … …., $\beta_{N1,}^{T})^{T}$, M = $(M_{1,}^{T}$ … … … … … … … … … …., $M_{N,}^{T})^{T}$,

$L_l = (L_{11,}^{T}$ … … … … … … … … … …., $L_{N1,}^{T})^{T}$, and $(\varepsilon_{it,}^{T}$ … … … … … … … … … …., $\varepsilon_{Nt,}^{T})^{T}$. When we pre-multiply the above expression with M^{-1} gives the GVAR model.$x_t = M^{-1}\beta_0 + M^{-1}\beta_1 t +$ $M^{-1} L_1 x_{t-1} + M^{-1}\varepsilon_t = \gamma_0 + \gamma_{1t} + R_1 x_{t-1} + e_t$,

Where γ_0 and γ_1 show k×1 global vectors consisting of deterministic terms,R_1 indicates a k×k dimensional global coefficient matrix, and e_t the k×1 dimensional vector of global residuals. $e_t \sim N(0, \sum_{et})$ is a Gaussian shock with $\sum_{et}$ showing the k×k dimensional variance-covariance

matrix. The $\sum_{et} = M^{-1}\sum_t M^{-1T}$ is a full matrix.It indicates that the contemporaneous relations in the model are effectively driven by the components that determine M, namely θ_{i0} and the weights $w_i = (w_{i1} \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots, w_{iN})^T$.

The global representation of the model for the more general case with $P^* = \max(P, Q)$ lags:

$$x_t = \gamma_0 + \gamma_{1t} + \sum_{j=1}^{p*} R_j\, x_{t-j} + e_t, \qquad e_t \sim N(0, \sum_{et}) \qquad (4)$$

Here R_j(j=1,……..,p*) with k×k dimensional global coefficient matrix.

4.1Prior specification

The BGVAR model builds on country-specific sub-models, and the uncertainty regarding the variable selection is solved through employing SSVS prior (George et al.,2008). This prior ensures that country models that fully integrate the prevailing heterogeneity observes in the world economy. For the prior implementation it is convenient to work with stacked $K_i = 2K_i + K_i^2 + 2K_iK_i^*$dimensional vector of coefficients for country,$\text{Ⱶ}_i = (\beta_{i0}', \beta_{i1,}' vec(\theta_{i1})', vec(\tau_{i0})', vec(\tau_{i1})')'$.

The SSVS prior assumes mixture normal prior to each coefficient.

$$\text{Ⱶ}_i|\Omega_{ij} \sim \Omega_{ij}N(0,\tau_{io}^2) + (1 - \Omega_{ij}N(0, \tau_{i1}^2)$$

For j = 1,……K_i

Here Ω_{ij} is a binary random variable. This will become 1 if variable j is included in country model i and zero otherwise. This type of prior belongs to the class of “spike and slab” priors which are widely used in Bayesian variable selection procedures. The spike component in SSVS prior pushes the associated posterior estimates towards zero. The remaining coefficients, the slab coefficient, resemble a non-informative prior has little impact on the posterior estimate. As a byproduct of the SSVS prior, we can also estimate posterior inclusion probabilities(PIP)

for each coefficient j in country i based on the posterior draws of Ω_{ij}.The spike and slab specification has excellent theoretical properties(Bhattacharya et al.2015).As the last step. We base our inference on the posterior draws of $\digamma_i$.The SSVS prior has the advantage of flexibility and control for model uncertainty. This prior imposes a scale mixture of two Gaussian distributions on each element.

Here, we utilize an inverted Wishart prior for constructing a country-specific variance-covariance matrix

$$\Sigma_{\varepsilon,i} \sim IW(S_i, V_i)$$

S_i is a $k_i \times k_i$ prior scaling matrix and V_i denotes the prior degress of freedom.Since $\Sigma_{\varepsilon,i}$ is a symmetric and positive definite matrix, the following factorization is utilised.

$$\Sigma_{\varepsilon,i} = C_i^{-1} C_i^{-1\prime}$$

Here C_i^{-1} denotes the lower Cholesky factor of $\Sigma_{\varepsilon,i}$.The prior set up is wrapped up by imposing Bernoulli prior on Ω_{ij},

$$\Omega_{ij} \sim Bernoulli(\underline{p}_{ij})$$

$\underline{p}_{ij}$ is the prior inclusion probability of a variable j, such that $p(\Omega_{ij} = 1) = \underline{p}_{ij} = 0.5$. It indicates that a priori every variable is equally likely to enter the model. Estimation of the BGVAR model with SSVS specification can be done using Gibbs sampling scheme outlined by George et al(2008) where it follows iteration among draws from the conditional posteriors of $p(\Sigma_{\varepsilon,i}|D, \digamma_i, \Omega_{ij})$ and $p(\Omega_{ij}|D, \digamma_i, \Sigma_{\varepsilon,i})$,D denotes the data. Here the expression $\digamma_i$ is a normal distribution, $\Sigma_{\varepsilon,i}$ is a Wishart distribution and Ω_{ij} follows a Bernoulli distribution.

5.0 Results and Discussion

5.1 Model Diagnostics and Stability Analysis

This section provides the results of model convergence properties of MCMC (Markov Chain Monte Carlo), which compares the mean of the samples taken from the end of the MCMC chain and the beginning of the same. Assessing the convergence of this estimation constitutes a fundamental step in validating the robustness and credibility of Bayesian inference. For this Z-like statistic is used to know whether the posterior distribution has converged to its intended target distribution. The samples appear to be drawn from the stationary distribution of the chain if these two means are equal. Consequently, when the chain length gets closer to infinity, Geweke's CD statistic (Geweke,1992) resembles a typical normal distribution. In our analysis, we separate the trade and financial linkages and estimate two models separately to know how international reserves respond to the determinants. Tables A2 & A3 show the convergence properties of MCMC Chain, serial autocorrelation between the errors and the average pairwise autocorrelation. They are given in the Appendix.

In Table A2 , the Geweke's CD statistic shows that the majority of the variables converge. The F-test is used for identifying the first-order autocorrelation of the cross-unit residuals. The share of p-values falls into different significance categories. Since the null hypothesis is that no serial autocorrelation, we need more p-values, which should be greater than 0.1. So here, most of the variables are not exhibiting serial autocorrelation. The last part of the model diagnostics shows the average pairwise cross-unit correlation of the residuals. The residual correlation analysis indicates that the model performs well in capturing the dynamics of international reserves. Specifically, 100% of the residual correlations for international reserves are below 0.1, suggesting that after accounting for global spillovers, the shocks to international reserves across countries are effectively uncorrelated. This aligns well with the BGVAR assumption of weak cross-unit residual dependence and supports the model's structural validity.

Similarly, in the financial channel (Table A3)the Geweke's CD statistic shows that the majority of the variables converge. Most of the variables did not have serial autocorrelation, which shows model stability. Coming to the average pairwise cross-unit correlation of the residuals, it shows that 100% of the residual correlations for international reserves are below 0.2, suggesting that the shocks to international reserves across countries are effectively uncorrelated.

Overall, the convergence diagnostics and residual correlation results confirm the statistical soundness and stability of the estimated BGVAR models. The absence of significant serial correlation and the low pairwise residual correlations across countries indicate that the models successfully capture the underlying global linkages while maintaining weak cross-sectional dependence, a key assumption of the BGVAR framework.Hence, the estimated models provide a reliable basis for subsequent inference on the dynamic responses of international reserves to external shocks transmitted through trade and financial channels.

5.2 Posterior Inclusion of Probabilities

As mentioned earlier the SSVS prior in the BGVAR model is essential to address the problem of model uncertainty and overparameterization that often arises in high-dimensional global models. In a multi-country framework such as the BGVAR, a large number of domestic and foreign variables are included, making it difficult to determine which variables exert the most significant influence on international reserves.The SSVS prior introduces a Bayesian shrinkage mechanism that systematically selects the most relevant predictors by assigning higher inclusion probabilities to variables that contribute meaningfully to explaining the variation in reserves. The resulting Posterior Inclusion Probabilities (PIPs) provide a probabilistic measure of variable importance, allowing us to identify which domestic and foreign factors are most influential in driving reserve accumulation. We consider the variables with PIP $\geq$

0.5(Feldkircher &Huber,2016), which explains how the domestic and foreign variables play an important role in determining international reserves. This is one of the advantages of this prior, which allows us to look at the PIPs to gauge the importance of particular variables for identifying the major determinants of international reserves in trade and financial channels separately.

Firstly, we examine the trade channel as a determinant of international reserves among EMEs, and several domestic macroeconomic variables emerge as critical determinants, as given in Table I. Among these, GDP, as a key determinant of a country's capacity to engage in international trade and reserves, shows a significant relationship in India and China. The domestic inflation also contributes to the international reserves accumulation in the case of Chile and Mexico. Interestingly, the equity market prices appear to be a significant determinant of international reserves accumulation only in Peru and Malaysia.

The exchange rate shows strong relevance in China, India, Peru, the Philippines, and South Africa. This finding underscores the role of reserves as a tool for exchange rate stabilisation, particularly in economies with vulnerability to external shocks. This behaviour closely aligns with the mercantilist motive. The effect is even more pronounced when determinants are constructed using trade-weighted averages, as it emphasises the relative position of a country’s currency against those of its key trading partners. The interest rate, another important determinant of the international reserves, shows high relevance in the EMEs; China, Mexico and Peru.

As mentioned earlier , one of the key advantages of employing a BGVAR model is its capacity to incorporate foreign spillovers through the use of weights.Among the foreign variables, the GDP of other economies is found to be significant only for Chile, suggesting that output spillovers from major trade partners or global growth conditions have limited influence on

reserve accumulation in EMEs. The international reserves of other economies emerge as a significant determinant in EMEs, except Argentina, Chile and Peru. This finding supports the hypothesis of "reserve demonstration effects", where EMEs respond to the accumulation behaviour of peer countries. The foreign inflation rate is significant only in Peru and Thailand. The equity prices of other economies exhibit relevance in Argentina, Brazil, Chile, China, India, Indonesia and South Africa, underscoring the importance of cross-border portfolio dynamics. The exchange rate of trading partners is also a key factor, being significant in China,Chile,India, Indonesia, Malaysia, Mexico, Philippines, and Thailand. This result highlights how competitive exchange rate pressures and global currency movements influence domestic reserve strategies. Similarly, foreign interest rates are significant only for Malaysia, suggesting sensitivity to international monetary policy conditions and their spillover effects. Finally, oil prices, as a global commodity indicator, are significant in Malaysia, the Philippines and Thailand, reflecting external vulnerability to terms-of-trade shocks in oil-importing countries.

Table II provides the determinants of international reserves in the financial channel. This channel plays a crucial role in shaping the accumulation of international reserves in EMEs, as it captures the sensitivity of capital flows and financial market conditions. However, the influence of domestic macroeconomic variables through this channel reveals considerable heterogeneity across EMEs. Among the domestic factors, the GDP shows a significant relationship with reserves only in China and Malaysia. Inflation appears significant only in Mexico. The impact of domestic equity markets is more limited, with equity prices showing significance only in Peru, potentially reflecting the role of domestic financial market development and investor sentiments in influencing reserve management strategies. Exchange rate shows significance across China, Malaysia, the Philippines, South Africa, and Turkey, indicating that central banks in these economies are actively managing reserves in response to

exchange rate volatility. Lastly, domestic interest rates, which influence the cost of holding reserves, are significant in China, Mexico, and Peru. This suggests that in these economies, interest rate changes are linked to short-term capital flows and reserve buffers. Overall, these results underscore the heterogeneous operation of the financial channel across EMEs, highlighting that domestic macro-financial conditions interact with external vulnerabilities.

The analysis of foreign factors through the financial channel reveals several key insights. The GDP of other economies shows limited influence, with significance only in Indonesia and Malaysia. However, the international reserves of other economies emerge as strong predictors of domestic reserves in Brazil and Thailand, indicating possible reserve spillover effects. Inflation is also relevant for Chile and Thailand. Foreign equity prices play a significant role in China and Indonesia, reflecting linkages. The exchange rates of other countries significantly impact reserve dynamics in Brazil, India, Indonesia, Malaysia, Mexico, the Philippines, and Thailand, which highlights the interdependence of currency markets. Foreign interest rates impact China, underscoring capital flow risks, while oil prices significantly shape reserve dynamics in China and Malaysia.

Table I: PIPs when determinants are in the Trade Channel

lnir	Arg(IR)	BRA(IR)	CHN(IR)	CHL(IR)	IND(IR)	INS(IR)	MAS(IR)	MEX(IR)	PER(IR)	PHL(IR)	SA(IR)	THL(IR)	TUR(IR)
y_lag1	0.125	0.39	0.99	0.09	0.845	0.165	0.09	0.3	0.25	0.11	0.075	0.235	0.08
lnir_lag1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Dp_lag1	0.195	0.065	0.44	0.875	0.31	0.38	0.2	0.965	0.35	0.26	0.225	0.31	0.33
eq_lag1	0.325	0.08	0.185	0.24	0.19	0.345	0.535	0.11	1.00	0.115	0.09	0.26	0.395
ep_lag1	0.17	0.43	1.00	0.13	0.605	0.37	0.165	0.14	0.87	1.00	0.825	0.485	0.365
r_lag1	0.315	0.05	0.685	0.25	0.295	0.355	0.45	0.705	1.00	0.43	0.05	0.27	0.41
y*	0.065	0.045	0.325	0.57	0.355	0.4	0.065	0.11	0.055	0.09	0.08	0.11	0.04
lnir*	0.07	1.00	0.895	0.205	1.00	0.62	1.00	0.905	0.205	1.00	0.67	1.00	0.88
Dp*	0.285	0.11	0.365	0.345	0.2	0.165	0.19	0.14	0.56	0.23	0.065	0.515	0.485
eq*	0.845	0.655	0.585	0.865	1.00	0.96	0.36	0.225	0.325	0.125	0.675	0.245	0.195
ep*	0.095	0.09	0.77	0.505	0.74	0.62	0.915	0.97	0.095	0.635	0.425	0.515	0.315
r*	0.24	0.345	0.36	0.2	0.47	0.34	0.91	0.1	0.2	0.17	0.07	0.18	0.185
poil**	0.265	0.12	0.41	0.095	0.28	0.245	0.735	0.18	0.39	0.7	0.025	0.835	0.185
y*_lag1	0.03	0.08	0.265	0.525	0.795	0.305	0.135	0.165	0.04	0.095	0.05	0.195	0.055
lnir*_lag1	0.055	0.53	0.985	0.145	1.00	0.475	1.00	0.505	0.13	0.305	0.145	1.00	0.485
Dp*_lag1	0.245	0.12	0.37	0.285	0.205	0.175	0.18	0.27	0.275	0.19	0.14	0.47	0.19
eq*_lag1	0.215	0.26	1.00	0.535	0.575	0.99	0.42	0.2	0.15	0.165	0.17	0.75	0.24
ep*_lag1	0.095	0.045	0.05	0.625	0.835	0.255	0.92	0.085	0.21	0.675	0.195	0.955	0.385
r*_lag1	0.16	0.145	0.84	0.185	0.365	0.405	0.805	0.125	0.17	0.19	0.06	0.32	0.315
poil_lag1**	0.165	0.37	0.675	0.05	0.355	0.245	0.165	0.26	0.61	0.36	0.07	0.27	0.105

cons	0.145	0.18	0.52	0.88	0.655	0.475	0.42	0.49	0.205	0.085	0.215	0.6	0.12
trend	0.075	0.095	0.76	0.155	0.43	0.195	0.3	0.1	0.21	0.065	0.05	0.28	0.06

Table II: PIPs when determinants are in the Financial Channel

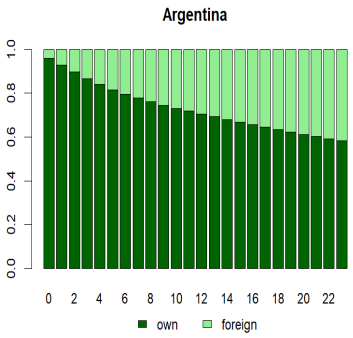
lnir	**Arg(IR)**	**BRA(IR)**	**CHN(IR)**	**CHL(IR)**	**IND(IR)**	**INS(IR)**	**MAS(IR)**	**MEX(IR)**	**PER(IR)**	**PHL(IR)**	**SA(IR)**	**THL(IR)**	**TUR(IR)**
y_lag1	0.15	0.23	0.995	0.135	0.345	0.375	0.815	0.235	0.43	0.135	0.085	0.43	0.25
lnir_lag1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Dp_lag1	0.27	0.075	0.13	0.375	0.24	0.33	0.38	0.88	0.195	0.29	0.12	0.18	0.165
eq_lag1	0.48	0.245	0.42	0.16	0.26	0.25	0.365	0.345	1.00	0.165	0.175	0.25	0.185
ep_lag1	0.14	0.385	0.98	0.14	0.435	0.47	1.00	0.24	0.415	0.955	0.86	0.22	0.885
r_lag1	0.395	0.135	0.69	0.215	0.28	0.23	0.32	0.72	0.98	0.23	0.165	0.3	0.235
y*	0.165	0.04	0.29	0.11	0.27	0.515	0.8	0.285	0.29	0.24	0.165	0.26	0.21
lnir*	0.42	1.00	0.4	0.175	0.335	0.315	0.235	0.17	0.305	0.21	0.305	0.94	0.275
Dp*	0.165	0.11	0.245	0.895	0.22	0.29	0.145	0.125	0.24	0.355	0.29	0.56	0.275
eq*	0.09	0.075	0.995	0.13	0.405	1.00	0.17	0.13	0.16	0.275	0.05	0.35	0.305
ep*	0.43	1.00	0.33	0.355	1.00	1.00	1.00	1.00	0.31	1.00	0.065	1.00	0.355
r*	0.105	0.065	0.915	0.135	0.275	0.075	0.245	0.22	0.075	0.21	0.05	0.065	0.11
poil**	0.27	0.1	0.995	0.125	0.26	0.14	1.00	0.395	0.385	0.17	0.07	0.16	0.11
y*_lag1	0.225	0.07	0.455	0.155	0.34	0.82	0.37	0.085	0.12	0.495	0.025	0.375	0.17
lnir*_lag1	0.63	1.00	0.92	0.14	0.5	0.19	0.21	0.195	0.145	0.34	0.475	1.00	0.12
Dp*_lag1	0.115	0.145	0.295	0.16	0.675	0.48	0.28	0.305	0.195	0.215	0.06	0.585	0.19
eq*_lag1	0.115	0.2	1.00	0.11	0.05	1.00	0.98	0.105	0.145	0.355	0.31	0.575	0.4

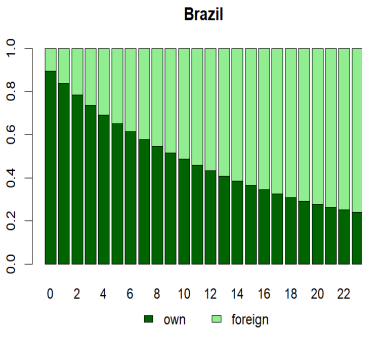
ep*_lag1	0.25	1.00	0.18	0.86	1.00	1.00	0.68	0.2	0.29	0.81	0.115	1.00	0.24
r*_lag1	0.095	0.08	0.235	0.135	0.17	0.4	0.13	0.155	0.025	0.155	0.09	0.055	0.16
poil_lag1**	0.165	0.14	0.28	0.15	0.135	0.115	0.145	0.55	0.325	0.13	0.11	0.175	0.105
cons	0.14	0.04	0.51	0.195	0.255	0.175	0.29	0.94	0.19	0.14	0.09	0.075	0.115
trend	0.115	0.075	0.56	0.12	0.32	0.145	0.11	0.935	0.205	0.135	0.1	0.115	0.075

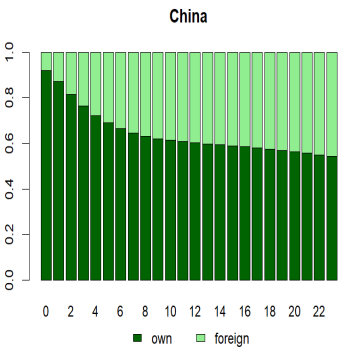
5.3 Generalized Forecast Error Variance Decomposition (GFEVD)

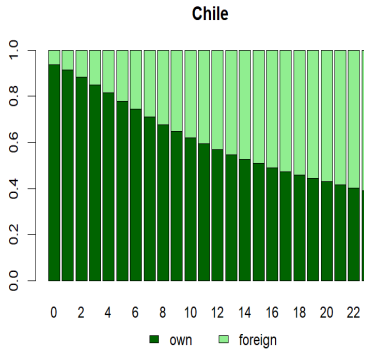
The Forecast Error Variance Decomposition(FEVD) shows how much each variable contributes to the other variables in the autoregression, thereby highlighting the role of domestic and foreign factors. Following Diebold and Yilmaz (2014), we can assess the cross-unit interlinkages through FEVD, and it can help us to know how a domestic variable is explained by a foreign variable. Here we use Generalized FEVD(GFEVD),which is independent of ordering and scaling (Pesaran &Shin,1998;Lanne & Nyberg ,2016). This will show how much internal and external influences drive an EME's reserves for a 24-quarter horizon.

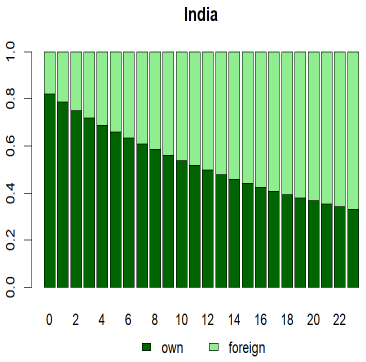
Figure 1 shows that the trade channel emerges as the dominant transmission mechanism in Argentina, Brazil, India, South Africa, and Turkey. In these economies, reserve holdings are particularly sensitive to trade-related shocks. On the other hand, in China, Chile, Indonesia, Malaysia, Mexico, and Peru, the financial channel exerts more influence(as shown in Figure 2). This suggests that these economies are more exposed to financial shocks, which, in turn, affect their reserve accumulation. Thus, there exists heterogeneity among EMEs in terms of external exposure and the channels through which global shocks influence their macroeconomic stability.

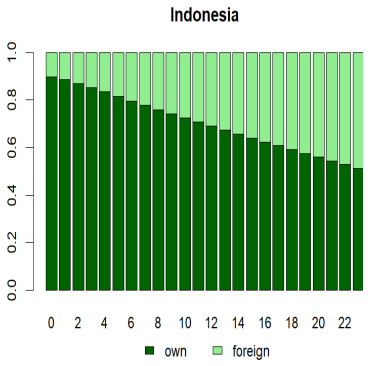

Argentina
0.0 0.2 0.4 0.6 0.8 1.0
0 2 4 6 8 10 12 14 16 18 20 22
own foreign

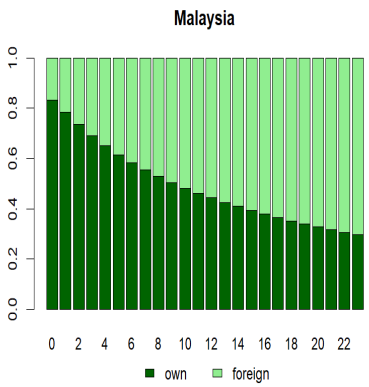

Brazil
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own foreign

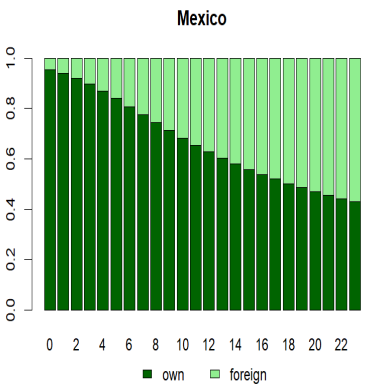

China
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own foreign

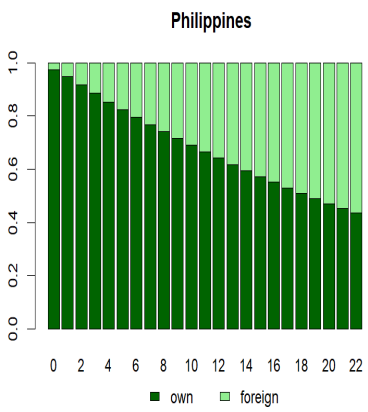

Chile
0.0 0.2 0.4 0.6 0.8 1.0
0 2 4 6 8 10 12 14 16 18 20 22
own foreign


India
0.0 0.2 0.4 0.6 0.8 1.0
0 2 4 6 8 10 12 14 16 18 20 22
own foreign


Indonesia
0.0 0.2 0.4 0.6 0.8 1.0
0 2 4 6 8 10 12 14 16 18 20 22
own foreign


Malaysia
0.0 0.2 0.4 0.6 0.8 1.0
0 2 4 6 8 10 12 14 16 18 20 22
own foreign


Mexico
0.0 0.2 0.4 0.6 0.8 1.0
0 2 4 6 8 10 12 14 16 18 20 22
own foreign


Philippines
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own foreign

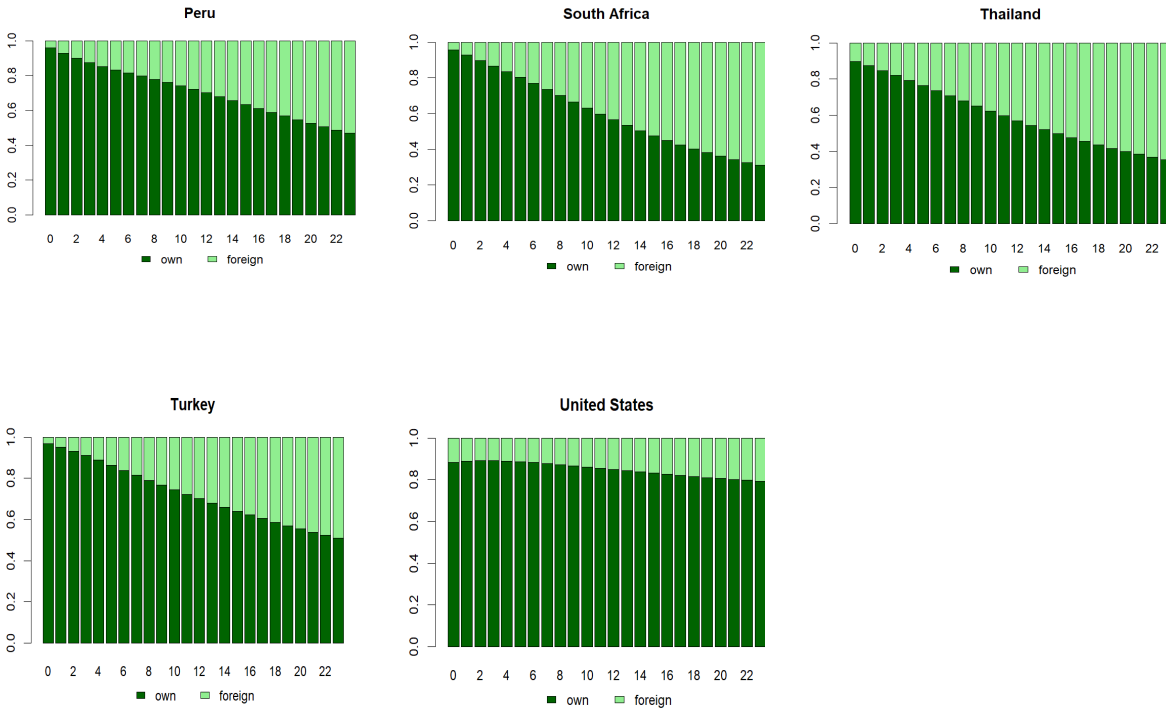
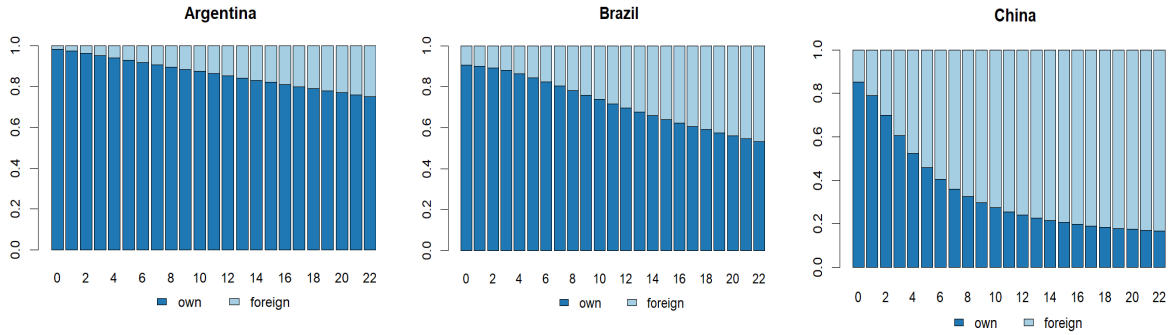


Figure 1: FEVD of international reserves through the Trade channel



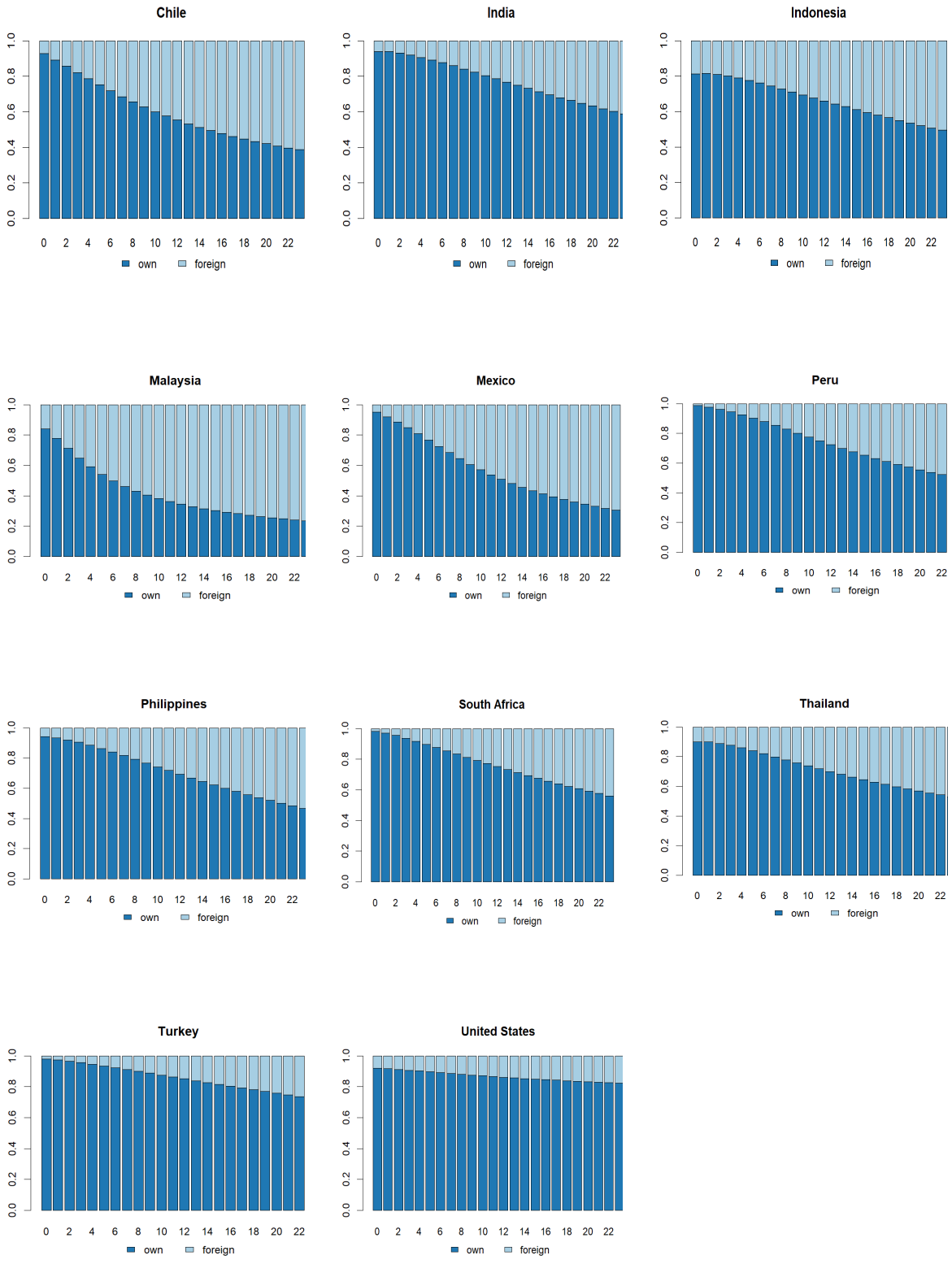
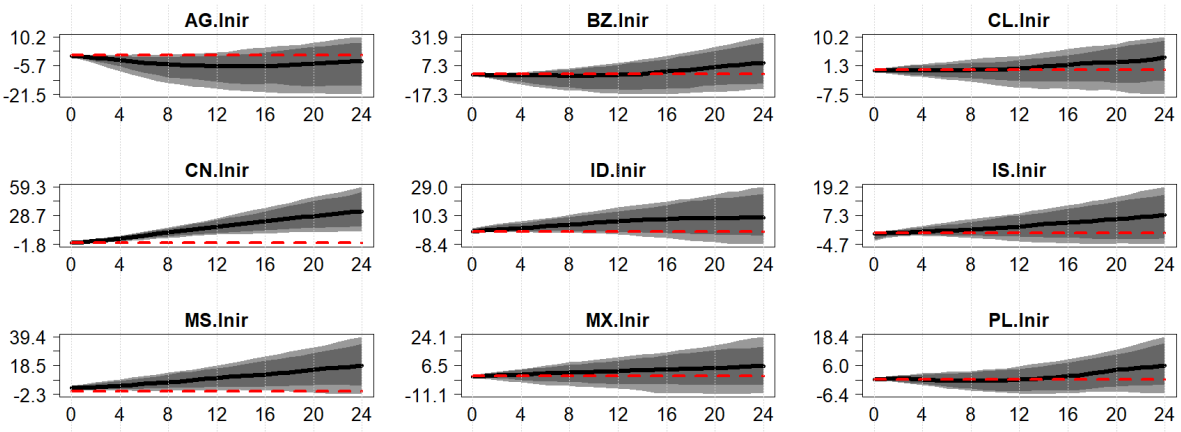


Figure 2: FEVD of international reserves through the Financial channel

5.4 Impulse Response Function

In this section, we analyse the cross-unit propagation of a local shock, mainly originating from the US, which is considered the dominant economy and its impact on the EMEs(Kaltenbrunner &Paincera,2017; Fritz et al.,2018; Paula et al.,2017; Kaltenbrunner,2015). Here we analyse how shocks in US macroeconomic variables are transmitted to the international reserve accumulation of EMEs via two channels: the trade and financial Channels. We use Cholesky decomposition to identify the shocks in US macroeconomic variables. The solid black line in the plot is the posterior median response along with 68% and 95% credible intervals. The red horizontal line marks the variable's pre-shock level, serving as a reference point for interpreting the impulse response. In these Impulse Response Function (IRF) plots, a statistically significant response is marked when the credible intervals do not include the reference level (zero), which is shown by a red line.

Firstly, we analyse how the expansionary and contractionary monetary policy of the US impacts the international reserves holdings of EMEs through both channels.The figures 3& 4 given below shows how 1 percentage decrease of the US interest rate affects the reserves holdings of EMEs.



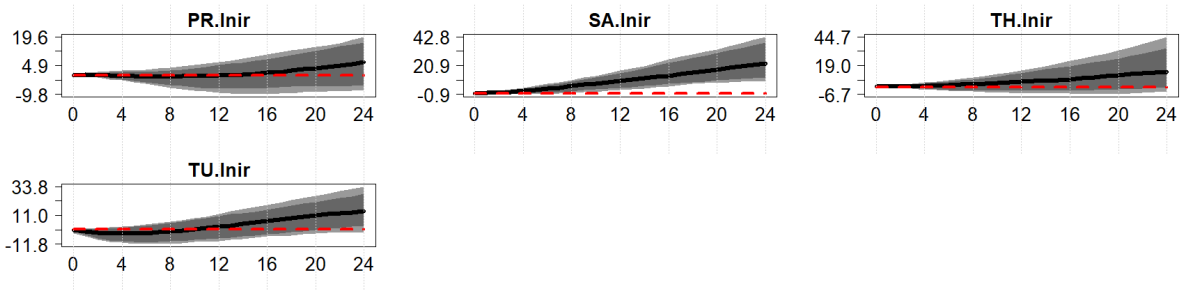


Figure 3 : Negative shock in US Interest rate in Trade Channel

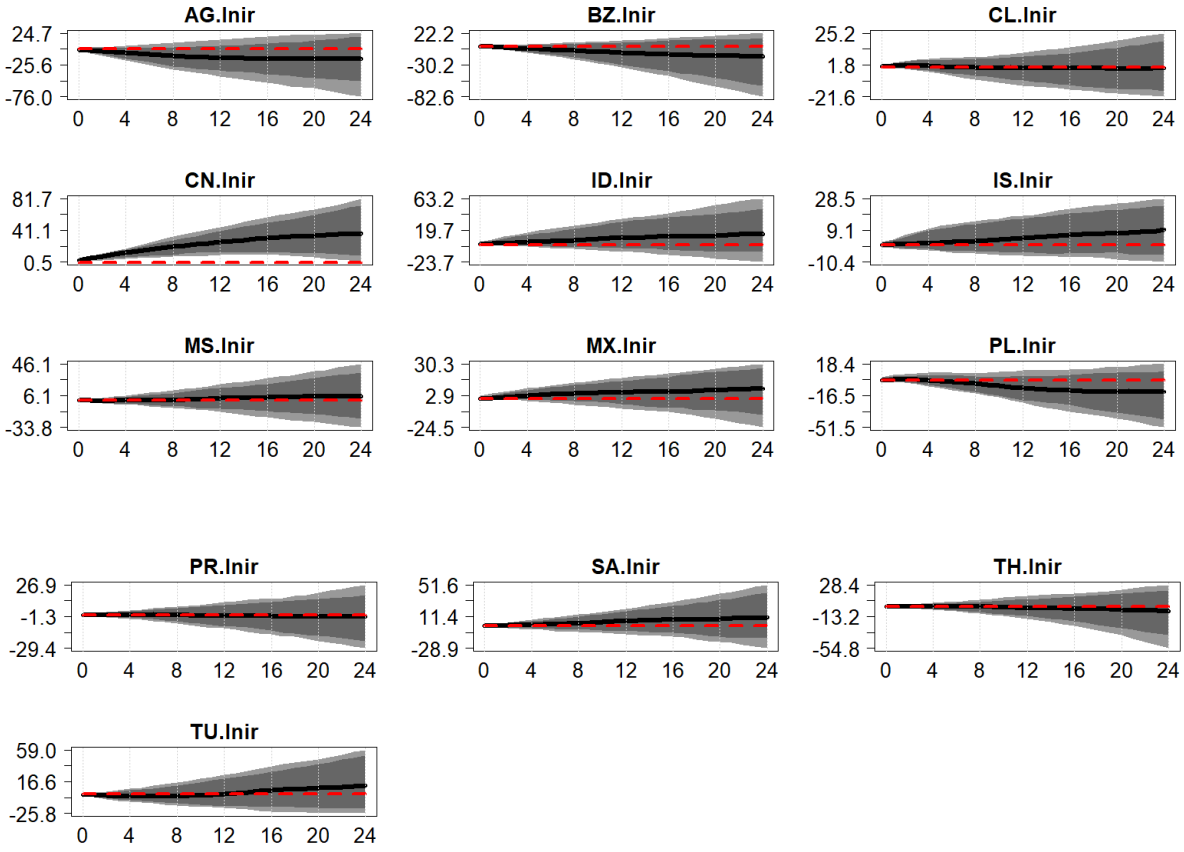


Figure 4: Negative shock in the US Interest rate in the Finance Channel

Figure 3 shows that most of the EMEs exhibit a persistent increase in reserves in response to the decline in US interest rates. This pattern is especially pronounced in economies such as Brazil, China, Indonesia, Malaysia, South Africa, and Turkey where the reserve accumulation response strengthens steadily over the 24- quarter horizon. The positive response likely reflects increased capital inflows and improved trade balances, as a reduction in US interest rates tends

to stimulate global liquidity and demand, indirectly benefiting export-oriented EMEs. In contrast, Chile,India,Philippines, and Argentina show weaker responses, indicating potential heterogeneity in the degree of trade integration. Figure 4 shows the effect of this shock in the financial channel and appears more heterogeneous than in the trade channel. While some countries like China, Indonesia, South Africa, and Turkey display a sustained increase in reserves over the 24-month horizon, others such as Argentina, Brazil, Philippines, and Peru experience a decline or negligible response, with confidence bands overlapping zero in most periods.These findings highlight that the transmission of US monetary policy through the financial channel is highly country-specific, influenced by the degree of financial integration, capital account openness, and macro-financial stability.

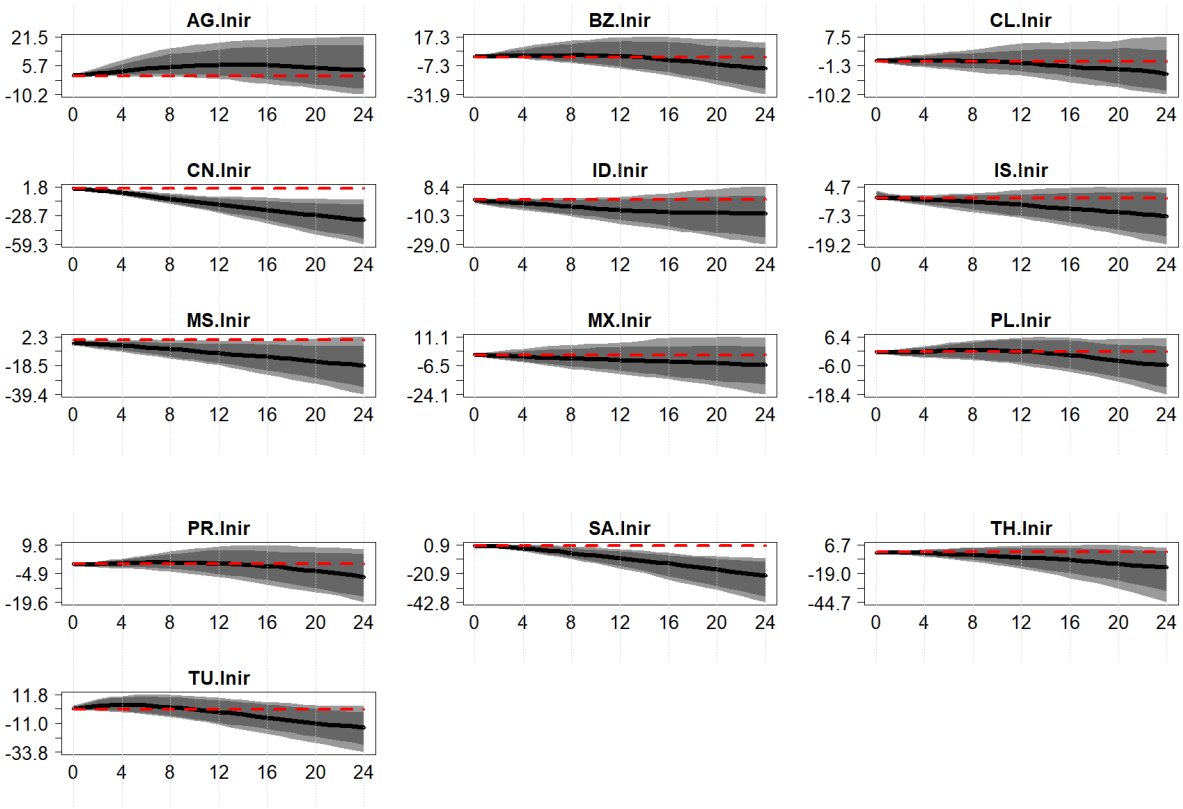


Figure 5: Positive shock in US interest rate in trade channel

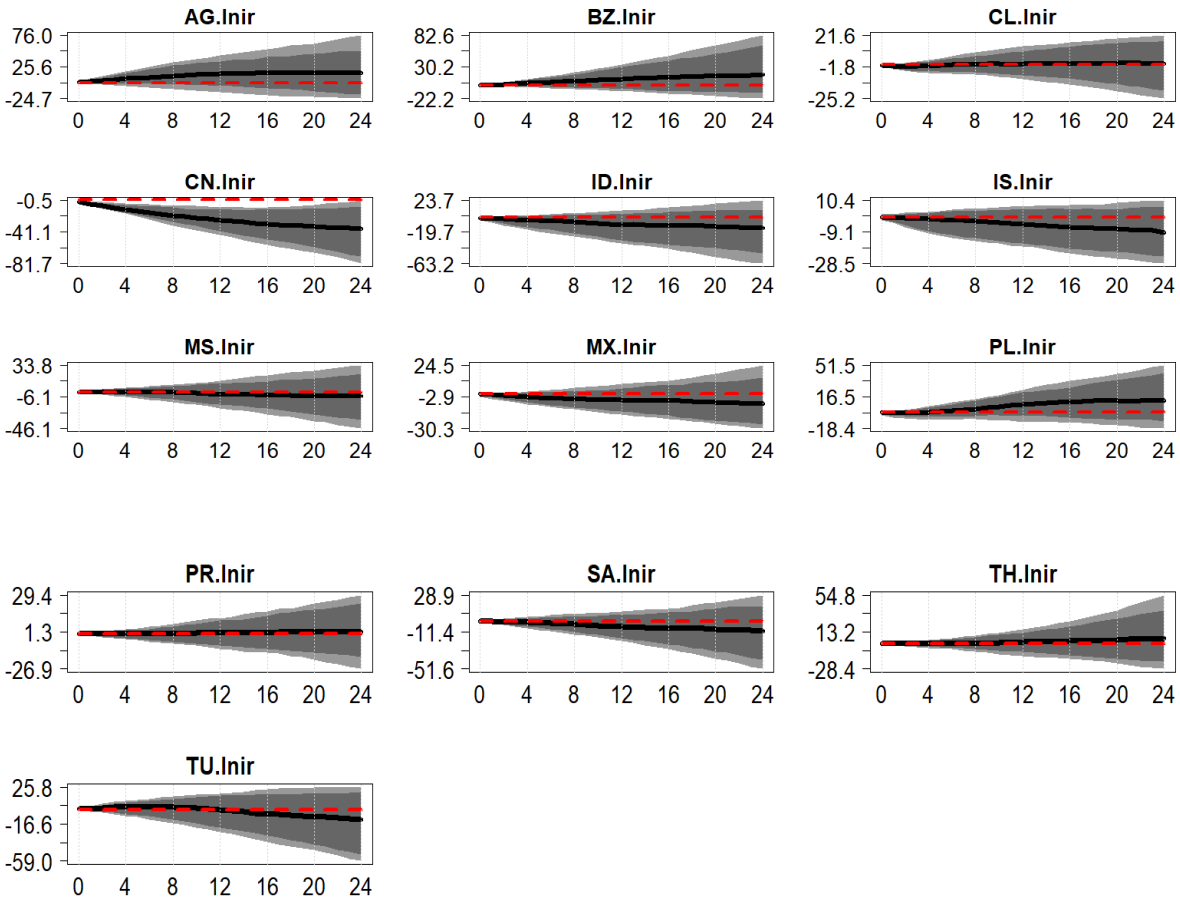
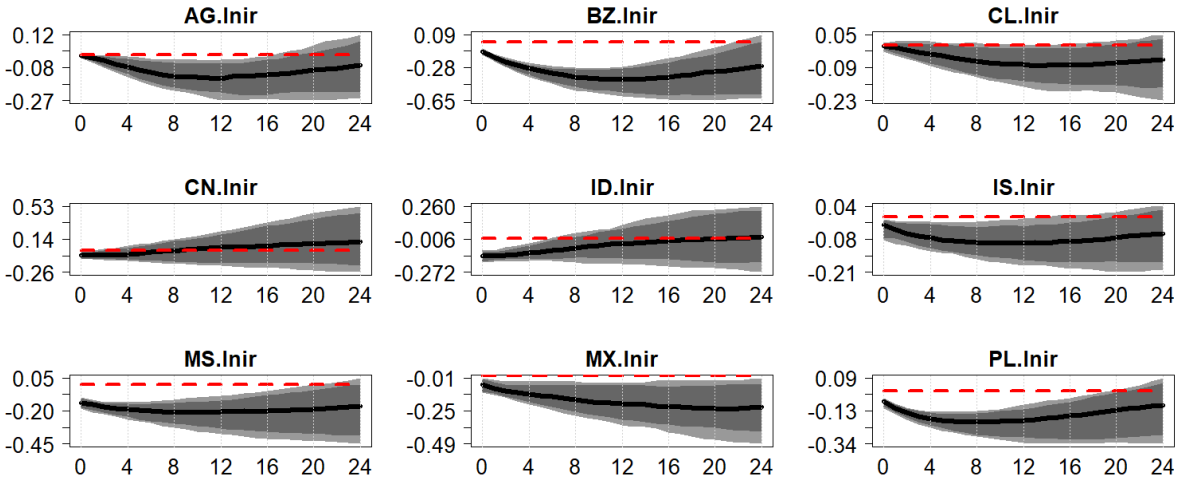


Figure 6: Positive shock in the US interest rate in the financial channel

The figures 5 & 6 illustrate the impact of positive U.S. interest shock on EME reserve holdings. Figure 5 shows that this shock generates a broadly contractionary effect; higher US interest rates reduces the global demand and adversely affect trade volumes and export revenues in EMEs. This effect is more pronounced in China, Indonesia, Malaysia, South Africa, Thailand, and Turkey show steep and persistent declines, indicating their vulnerability to monetary tightening. In contrast, Argentina and Brazil exhibit a more muted or even slightly positive short-term reaction, though this effect diminishes over time. Overall, our findings underscore the sensitivity of EMEs' reserves to US monetary tightening emphasizing the structural dependence of peripheral economies.

Figure 6 shows that the responses of EMEs are heterogeneous to a positive shock in US, but largely negative in financial channel. Higher U.S. rates affect the global portfolio reallocation and leads to capital outflows from EMEs.The effect is persistent in China, Indonesia, Malaysia, South Africa and Turkey, underscoring their exposure to global financial condition. At the same time, Argentina, Brazil, Philippines and Peru demonstrate a modestly positive response, possibly due to factors like relatively closed capital accounts, and active reserve management strategies.

Another important factor influencing EME reserve dynamics is reserve holdings of U.S,the issuer of dominant reserve currency. Given the central role of the U.S. dollar in the international monetary system, changes in U.S. reserve positions and liquidity conditions can have systemic effects on global financial markets. This dominance creates a hierarchical structure where EMEs often accumulate reserves as a precaution against external shocks originating from advanced economies, particularly the United States. Consequently, U.S. reserve dynamics can influence global capital flows, exchange rate stability, and the demand for reserves in EMEs. This provides a strong theoretical basis for including U.S. variables in models analyzing international reserve accumulation. Here we examine how negative shock to U.S reserves affect EMEs reserve holdings.



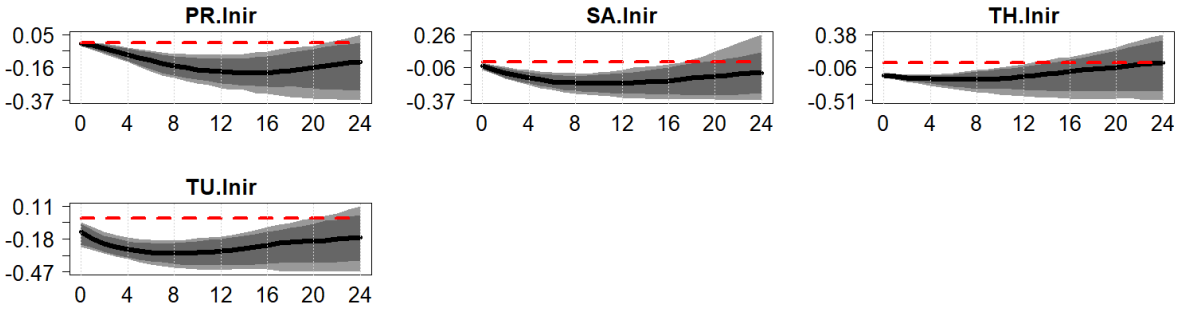


Figure 7: Negative shock in reserves of US through the Trade channel

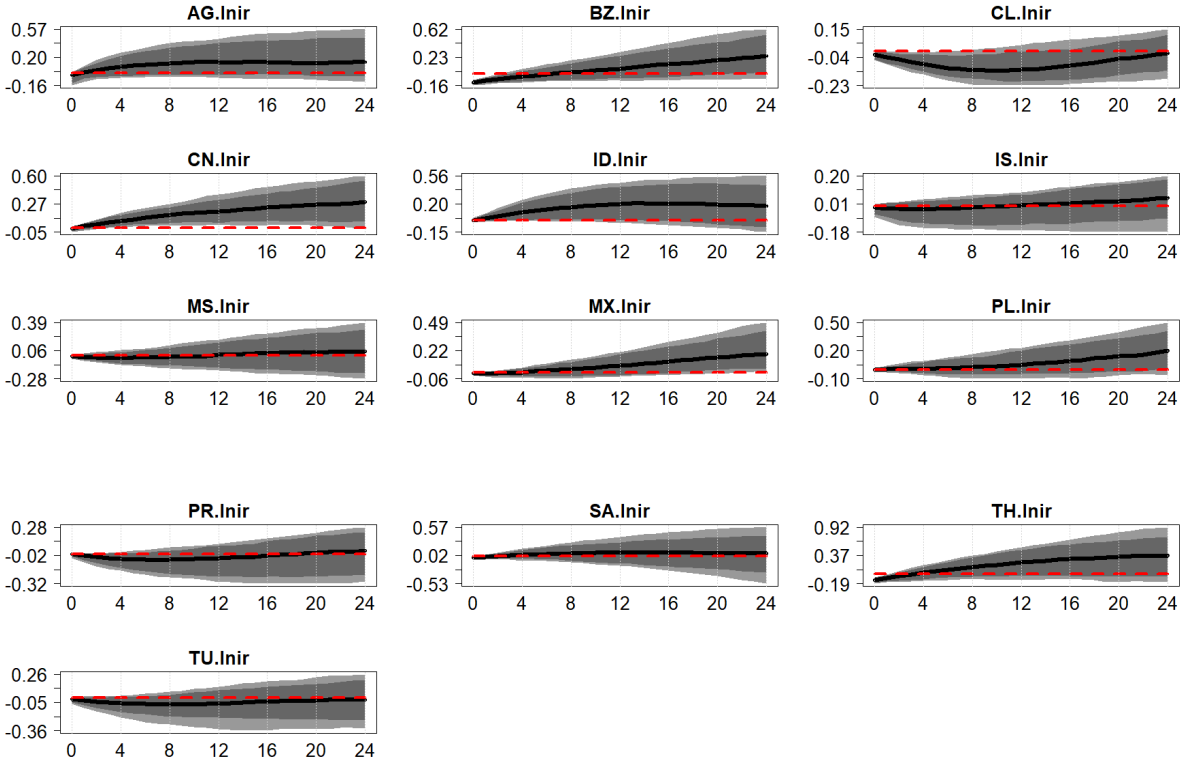


Figure 8: Negative shock in reserves of US through the Finance channel

Figure 7 shows that almost all EMEs exhibit an immediate and persistent decline in their own reserves following the negative shock in US reserves. This negative response is most pronounced in Argentina, Brazil, Chile, Mexico, and Turkey, where the decline remains significant throughout the 24-month horizon, highlighting their strong exposure to trade-linked global shocks. Interestingly, China shows a contrasting pattern, with a positive and gradually

increasing response, suggesting its relatively resilient trade position. Other EMEs, Indonesia, South Africa, and Thailand, show less persistent declines, indicating heterogeneity in trade exposure and buffer adequacy across EMEs. Overall, the statistically significant immediate declines observed in most economies underscore that a reduction in US reserves transmits adverse effects to EMEs' reserve holdings.

Figure 8 shows that, unlike the trade channel, where EMEs experienced negative impacts, here the majority of EMEs exhibit a positive response to the negative shock in US reserves over the horizon. In particular, Argentina, Brazil, China, Indonesia, and Thailand display a pronounced and statistically significant rise in reserves. This pattern suggests that a contraction in US reserves triggers precautionary reserve accumulation in EMEs, as they anticipate capital flow volatility. Interestingly, Chile, South Africa, and Turkey show a negative response, indicating that these countries face capital outflows. The positive responses in EMEs imply that the financial channel transmits the shock differently compared to the trade channel, prompting EMEs to strengthen their external buffers against the financial risks originating from the US.

6.0 Conclusion and Policy Implications

This study advances the understanding of international reserve accumulation in EMEs by analysing how the spillovers from EMEs(peripheral economies) and the United States, as the core economy, shape reserve holding dynamics. Using a BGVAR framework with SSVS priors, proposed by Feldkircher &Huber(2016), the analysis moves beyond the existing studies, which have ignored the spillover effects. This study captures financial and trade linkages between the economies that underpin the reserve accumulation strategies. The empirical results provide evidence that foreign factors, especially the international reserves, exchange rates, and equity prices of other economies, play a prominent role in determining reserve holdings in EMEs. We find the prominent role of exchange rates across both channels,

confirming with the existing studies(Aizenman et al.,2024, Thabana & Fasanya,2024,). Equity prices and interest rates also emerge as significant, particularly in the financial channel, reflecting the deepening integration of EMEs into global capital markets. We have also measured the GFEVD, which demonstrates the contribution of foreign variables in international reserves holding over time. The results show that the foreign variables become stronger in the long run. These results are true in the case of monetary policy transmission(Feldkircher & Huber,2016). This underlines the enduring nature of external spillover effects on reserves. The study further reveals heterogeneous patterns of channel dominance. Among the EMEs, except Chile, Indonesia, Peru, the Philippines, South Africa, and Thailand exhibit a transitory nature while considering the determinant and shock channels. Lastly, we estimate the shocks originating from the United States continue to exert significant influence on reserve dynamics in the periphery (Orsi et al., 2020; de Paula et al,2022).

The findings of this study yield important policy implications for EMEs. The strong and persistent influence of external factors in reserve accumulation highlights the limits of purely domestic policy measures in achieving financial stability. The central banks in the EMEs should consider the spillover effects while shaping the reserves policy in their economy. The impacts of shocks originating from the US on reserve accumulation of EMEs underscore the structural asymmetry of the international monetary system and the limited policy autonomy of EMEs. Policymakers should therefore pursue greater diversification of reserve assets and strengthen regional financial safety nets to mitigate the vulnerability to global uncertainties. The differentiated impact of trade and financial channels suggests that reserve management strategies should be tailored based on each economy's exposure; the trade-dependent economies should prioritise reserves as a buffer against exchange rate and export volatility, while financially integrated economies should hold precautionary reserves to counter capital flow fluctuations.

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Data Availability Statement

Not Applicable

Conflict of Interest

The authors have no conflicts of interest to declare.

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Appendix

Table A 1

Data Description

Variable	Description
y	Real GDP (2010=100, in logarithms.
dp	Consumer price inflation. CPI (2010=100), in logarithms.
ep	Real Exchange rate, in logarithms
eq	Real equity prices in logarithms
r	Short-term interest rate in logarithms ($0.25\ln(1+R_{IS}^{S}/100)$
Lnir/IR	International reserves excluding gold in logarithmic terms
poil	Price of oil, in logarithms.

Table A2: When determinants are in the Trade channel

Model Info: BGVAR-SV-SSVS
Prior: SSVS
Number of lags for endogenous variables: 1
Number of lags for weakly exogenous variables: 1
Number of posterior draws: 200/1=200
Number of stable posterior draws: 184
Number of cross-sectional units: 14

Convergence diagnostics

Geweke statistic: 2581 out of 7224 variables' z-values exceed the 1.96 threshold (35.73%).

Average pairwise cross-unit correlation of unit-model residuals

	y	ir	Dp	eq	ep	r
<0.1	0(0%)	14(100%)	12(85.71%)	2(14.29%)	12(92.31%)	14(100%)
0.1-0.2	1(7.14%)	0(0%)	2(14.29%)	6(42.86%)	1(7.69%)	0(0%)
0.2-0.5	8(57.14%)	0(0%)	0(0%)	6(42.86%)	0(0%)	0(0%)
>0.5	5(35.71%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)

F-test, First-order serial autocorrelation of cross-unit residuals

	P Values	in %
>0.1	41	48.81
0.05-0.1	4	4.76
0.01-0.05	8	9.52
<0.01	31	36.9

Table A3: When determinants are in the Financial channel

Model Info: BGVAR-SV-SSVS
Prior: SSVS
Number of lags for endogenous variables: 1
Number of lags for weakly exogenous variables: 1
Number of posterior draws: 200/1=200
Number of stable posterior draws: 170
Number of cross-sectional units: 14

Convergence diagnostics

Geweke statistic: 2392 out of 7224 variables' z-values exceed the 1.96 threshold (33.11%).

Average pairwise cross-unit correlation of unit-model residuals

	y	ir	Dp	eq	ep	r
<0.1	2(14.29%)	12(85.71%)	8(57.14%)	1(7.14%)	11(84.62%)	14(100%)
0.1-0.2	0(0%)	2(14.29%)	6(42.86%)	2(14.29%)	2(15.38%)	0(0%)
0.2-0.5	11(78.57%)	0(0%)	0(0%)	11(78.57%)	0(0%)	0(0%)
>0.5	1(7.14%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)

F-test, First-order serial autocorrelation of cross-unit residuals

	P Values	in %
>0.1	48	57.14
0.05-0.1	5	5.95%
0.01-0.05	12	14.29
<0.01	19	22.63

Table A4:Specification of the Country Variables

Country	Domestic Variables	Foreign Variables
AG	y,dp,ep,eq,r,ir	y*,dp*,ep*,eq*,r*,ir*,poil**
BZ	y,dp,ep,eq,r,ir	y*,dp*,ep*,eq*,r*,ir*,poil**
CH	y,dp,ep,eq,r,ir	y*,dp*,ep*,eq*,r*,ir*,poil**
CL	y,dp,ep,eq,r,ir	y*,dp*,ep*,eq*,r*,ir*,poil**
ID	y,dp,ep,eq,r,ir	y*,dp*,ep*,eq*,r*,ir*,poil**
IS	y,dp,ep,eq,r,ir	y*,dp*,ep*,eq*,r*,ir*,poil**
MS	y,dp,ep,eq,r,ir	y*,dp*,ep*,eq*,r*,ir*,poil**
MX	y,dp,ep,eq,r,ir	y*,dp*,ep*,eq*,r*,ir*,poil**
PR	y,dp,ep,eq,r,ir	y*,dp*,ep*,eq*,r*,ir*,poil**
PL	y,dp,ep,eq,r,ir	y*,dp*,ep*,eq*,r*,ir*,poil**
SA	y,dp,ep,eq,r,ir	y*,dp*,ep*,eq*,r*,ir*,poil**
TH	y,dp,ep,eq,r,ir	y*,dp*,ep*,eq*,r*,ir*,poil**
TU	y,dp,ep,eq,r,ir	y*,dp*,ep*,eq*,r*,ir*,poil**
US	y,dp,eq,r,ir,poil	y*,dp*,ep*,eq*,r*,ir*

Note: One star shows the weakly exogenous variables and double star show the global control variable.The table represents the general specification and variable cross-country variable coverage of our GVAR model. Throughout the paper we have used 1 lag for endogenous, weakly exogenous and strictly exogenous variables only.