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Spillover effects of global liquidity's expansion on emerging countries: evidences from a Panel VAR approach

Nady RAPELANORO[†]

Abstract

The attention for the global liquidity concept has grown over the recent years insofar as its dramatic increase is considered among regulators and economists as one of the possible determinants of the last global financial crisis. Although global liquidity remains without a generally accepted definition in the literature, the destabilizing effects of its expansion are widely studied, especially for the advanced economies. However, empirical studies regarding the consequences in the emerging countries are scarcer and this paper is related to this topic. We rely on a Panel VAR approach to investigate those effects on emerging economies and we find that the consequences are in line with the results of the literature on advanced countries. Nevertheless, contrary to previous empirical studies, we find that the choice of the exchange rate regimes is not important, as the exchange rate regime does not fully isolate the countries from a surge of global liquidity in the issuing countries.

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Introduction

Usually, *global liquidity* is a concept associated with the overall "ease of financing" in the major economies. However, despite its widespread usage, this hypothesis remains without a consensual definition. Specifically, the dramatic increase in global liquidity has been at the center of the debates between economists and policy-makers mainly because it has been proffered as a possible explanation for the financial developments in the last decade, especially those prior to the 2008 financial crisis. Global liquidity exerts an influence on international financial stability since its components are correlated to macroeconomic and financial developments such as strong increases in global monetary and credit aggregates, low bond yields, rising asset prices, commodity prices, and real estate booms (ECB, 2012). Especially during the pre-financial crisis period, monetary authorities further eased monetary conditions by drastically lowering the interest rates; some authors (Taylor, 2012, 2014; Hofman and Bilyana, 2012) argued that interest rates deviated from the Taylor rates, allowing the growth of global liquidity influence. This "great deviation" fueled the development of global liquidity conditions, leading to a major financial crisis that drove the global economy into a major recession. Furthermore, policies adopted by monetary authorities to mitigate the crisis have led to an additional increase in the global liquidity conditions. Indeed, major central banks decreased their policy rates to historic lows and as policy rates attained the zero bound level, central banks adopted unconventional monetary policies, particularly through quantitative easing, which allowed the global liquidity's question to be still relevant. Among economists and policy makers, the debate on the global liquidity focuses particularly on its transmission mechanisms from advanced countries to receiving economies (IMF, 2010; BIS, 2011) and their destabilizing effects on the receiving economies (Baks and Kramer, 1999). A specific strand of the literature, particularly important in the aftermath of the financial crisis, focuses on spillover effects on emerging countries (IMF, 2010; Brana and Prat, 2011) and this study is related to this topic. We contribute to the literature by using an innovative approach to the spillover effect issue, introducing new macroeconomic variables and advanced econometric methodology to assess the consequences of the global liquidity expansion on the economy of these receiving countries.

The rest of this paper is structured as follows. Section 1 proposes a definition of global liquidity and explains its measure. In section 2, the determinants of global liquidity are investigated. Section 3 is dedicated to the channels by which global liquidity exerts an

influence on other countries. In section 4, we investigate the spillover effects of global liquidity expansion by focusing on emerging economies. A last section concludes.

Specifically, in order to identify the consequences of global liquidity from the perspective of the emerging countries, section 1 to section 3 allow us to define an appropriate framework for our analysis, including a consensual definition for the concept of global liquidity; construction of global liquidity indicators specific to developed countries and their evolution throughout the chosen period; the evaluation of potential sources of global liquidity in both developed and emerging countries; and finally, the identification of transmission channels to receiving economies. In section 4, we investigate the related literature on the topic; then we examine the consequences of global liquidity in the emerging countries by applying a PVAR methodology. For this purpose, we implement 3 types of models: first, we construct a benchmark model using all the countries of our sample. Second, we analyze the effects on regional models. Third, we examine the effects of global liquidity according to the exchange rate regime. Finally, we use an alternative measure of global liquidity as robustness checks.

I. The global liquidity: definition and measure

The concept of global liquidity was defined for the first time by Baks and Kramer (1999). However, it remains a rather vague concept without consensual definition. The definition adopted in this work is based on BIS (2011) and ECB (2012) that provide a provisional definition summarizing the different approaches used in previous studies. We focus on the financial stability approach of global liquidity by distinguishing global liquidity into two components: official liquidity and private liquidity. However, a second approach of the global liquidity exists, which particularly focuses on its effects on consumer prices and inflation from a monetary policy perspective by considering two other components of global liquidity, via monetary liquidity and financial market liquidity.

1. Basic considerations

The official or public liquidity is defined, as the funding that is unconditionally available to settle claims through monetary authorities. Basically, it implies the monetary base including currency and reserved requirements of the banking sector at the central bank.

This form of liquidity evolves only from the regular monetary operations and policy intervention of the monetary authorities in the money market.

Several tools are available to obtain the official liquidity in foreign currency; the most frequently used is the central bank reserve-accumulating policy. Secondly, the use of swap lines between banks has also turned out to be one of the methods used to obtain official liquidity. Finally, the last possibility is through monetary instruments such as the IMF's special drawing rights. It is important to note that using these monetary instruments is subject to certain conditions; for example, the use of SDR for an exchange against a certain amount of local currency is limited. Moreover, these instruments do not contribute to the process of money creation but are only means to use official liquidity.

It is important to note that there is a fundamental difference between official domestic liquidity and official "global" liquidity. From a domestic point of view, the official liquidity is endogenous because the central bank is the only institution that can provide this type of liquidity using monetary creation and it can be extended indefinitely according to the objectives of monetary authorities. At an international level, the creation of global official liquidity is exogenous for "non-reserve currency countries" since they rely on access to "major currencies" and their evolution depends on the monetary policies of these issuing countries.

The private liquidity is defined as the global liquidity component produced by the private sector, essentially by financial intermediaries.

At domestic level, financial intermediaries create private liquidity by issuing safe and redeemable liabilities against long-term risky assets using maturity transformation. As risks due to the transformation process are not fully internalized by banks, profits generated by this activity leads to built-in incentives to create excess private liquidity (Stein, 2011). In turn, this situation can generate liquidity mismatch (Brunnermeier et al., 2013) and lead to endogenous risk through the possibility of runs. The financial intermediaries' maturity transformation activities are unstable and their fragility can be compensated by financial regulation and supervision during stable periods and providing liquidity through the lender of last resort during a financial crises.

At global level, with international financial integration, a similar transformation process is observed. The global private liquidity is mostly created through financial intermediaries' cross-border activities such as cross-border credit and foreign currency lending. According to BIS (2010) and the Committee on the global financial system (2011), private liquidity depends on the willingness of counterparties to extend credit or take risk against each other

at the domestic or global level. Domestic and global private liquidity are subject to aggregate supply and demand shocks with sudden shift in risk aversion and liquidity preference, which are the results of leveraging and deleveraging by private sector.

Moreover, global private liquidity involves cross-border liquidity and maturity transformation that provides more complexity and creates more fragilities than pure domestic private liquidity because it needs currency transformation. It is also influenced by the multiplicity of decentralized monetary and regulatory decisions, which explains why cross-border liquidity can be more sensitive than domestic liquidity. In turn, this situation may generate powerful amplification mechanisms during a financial crisis, which might be difficult to predict.

Finally, private liquidity can be converted into official liquidity through foreign exchange interventions and exceptionally, such as during the last financial crisis, through dollar facilities implemented by foreign central banks via currency swaps. The substitution between private and official liquidity is essential for any financial system because in essence, private liquidity can expand indefinitely as long as financial intermediaries are willing to fund each other. The main problem arises during financial crises; when private liquidity is not available and the global liquidity is reduced to its official component, the question is whether official liquidity can compensate or substitute the scarcity of private liquidity.

2. Measurement

For the purposes of our analysis, we construct several indicators measuring global liquidity conditions. Numerous empirical indicators can be used as global liquidity indicators, especially those derived from money and credit aggregate, which are the fundamental methods used in previous studies. The indicators are essentially based on narrow monetary aggregates (typically banknotes and coins plus highly liquid bank deposits) or based on broad monetary aggregates that also include less liquid bank deposits and marketable instruments issued by monetary financial institutions). The narrow monetary aggregate has the advantage of homogenous components across economies, rendering the resulting measure is thus easier to interpret. On the other side, broad monetary aggregates provide a less volatile structure of monetary growth in individual economies, as they internalize substitution among the different liquid assets. The main argument over choosing the broad monetary aggregates is its capacity to capture both public and private liquidity through the

monetary and market liquidity conditions. So the broader the monetary aggregates are, the greater its capacity to measure the global liquidity conditions.

Two quantity-based indicators are used in this study using broad money and narrow monetary aggregates. Such indicators are in line with previous related literature.

The first indicator developed by Baks and Kramer (1999) is the sum of the broad money of the advanced countries in US dollar expressed as:

$$GL_1 = \sum_{i=1}^{4} \left(\frac{M^i}{S_i} \right)$$

Where M_i represents the monetary aggregates (narrow or broad money) and S_i is the exchange rates between the local currency and the dollar.

The second indicator is a GDP weighted global liquidity indicator that expresses the hypothesis of the existence of global excess liquidity. It is defined as the ratio between narrow or broad money aggregates and nominal aggregate GDP of advanced economies. This alternative indicator is developed by Ruffer and Stracca (2006):

$$GL_2 = \sum_{i=1}^{4} \left(\frac{M^i}{GDP^i} \right) . \frac{1}{S_i}$$

3. Overview of the 2000-2014 global liquidity expansion

In this sub-section, we undertake an historical analysis of global liquidity centered on the indicators we have previously developed and on Shin's framework **(**2012, 2013) regarding the identification of the two phases in the global liquidity cycle during the period 2000-2014.

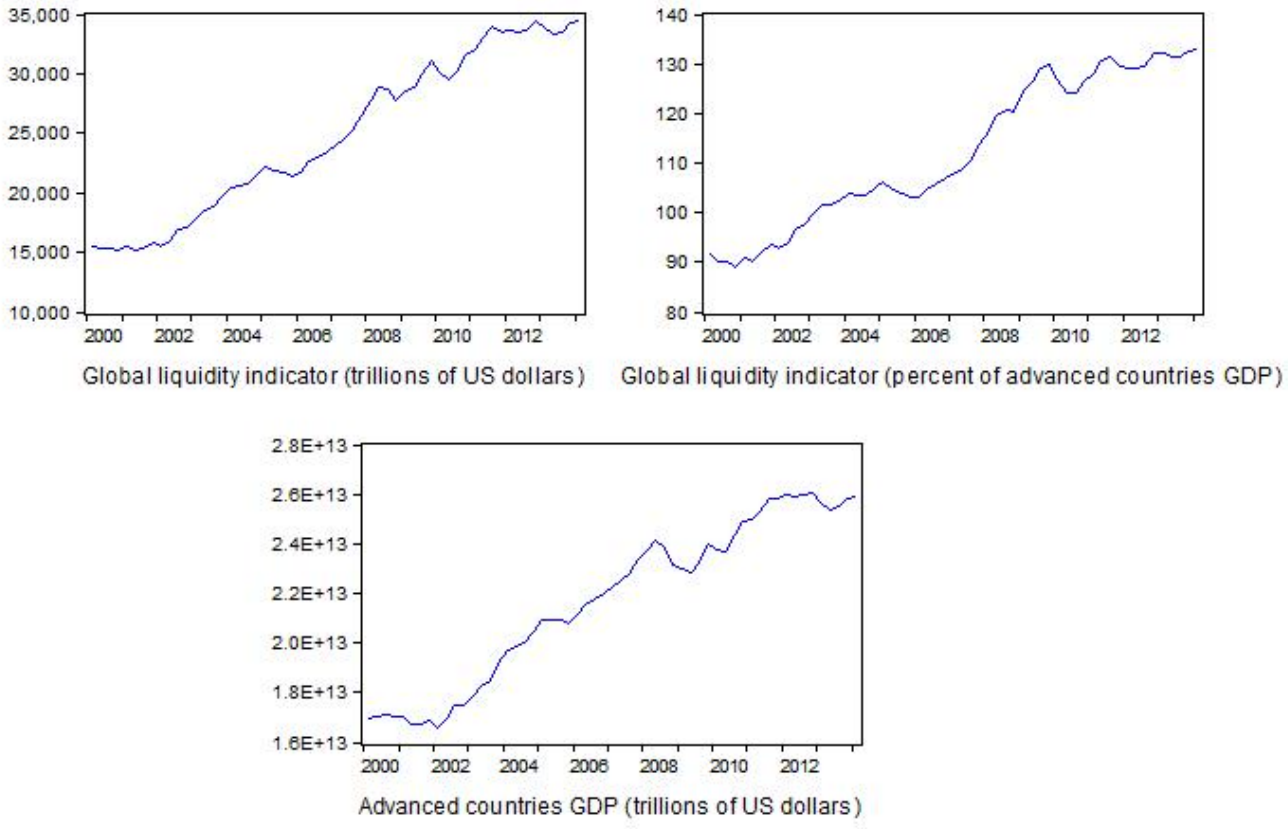
The first phase of global liquidity starts in early 2000 following the burst of the Internet bubble in developed countries and ends with the advent of the global financial crisis (GFC). Several factors could explain the surge of global liquidity during this period, mainly the determinants that affect the evolution of its components. With reference to the public component, this first phase is marked by the prevalence of Federal Reserve engagements upon the developments of global public liquidity component. This phase is characterized by a period of consecutive accommodative monetary policy, easing monetary conditions and decreasing key policies rates, especially after the burst of the dot.com bubble that pushed the Fed and the Bank of Japan (BOJ) to adopt such policies to overcome the effects of the crisis. Consequently, between 2001 to 2003, the key policies rates decreased from 6,5% to 1% in the US and the BOJ decreased their interest rates to 0.15% until 2006. The

European central Bank (ECB) and Bank of England (BOE) have also experienced some cycles of easing and tightening of their monetary conditions, especially between 2001 and 2005 when the ECB adopted an accommodative monetary policy following the introduction of the euro currency. These consecutive decreases of key policy rates and monetary easing by central banks have contributed to increase the influence of global public liquidity component. Concerning the private global liquidity's component, its main growth driver is the international banks leverage, involving the European banks intermediating US dollars credit developed by Shin (2012) under the "global banking glut" phenomenon. The amplification of these international banks activities, especially through the shadow banking system has contributed to the continuous rise of the global liquidity indicator during this phase, which led to the global financial crisis. Hence, during the first phase, the global liquidity indicator rose from 89%, following the burst of the dotcom bubble, to 114% of G4 GDP in 2007 4th quarter.

In the third quarter of 2008, Lehman Brothers bankruptcy initiated the global financial crisis, which was characterized by a breakdown of the global private liquidity component. This situation has reduced global liquidity solely to its public component. At the peak of the crisis, the public component is essentially determined by the combined actions of the central banks in advanced economies to counter the effects of the financial crisis, particularly through the implementation of a zero interest rate policy and a general decrease in policy rates, the easing of the monetary conditions and finally an unconventional monetary policy through quantitative easing, adopted initially by the Fed (September 2008) and then by the BOE (march 2009). Consequently, these central banks interventions to support both financial and real economic spheres have led to a continuous increase of the global liquidity indicator during the crisis building up from 114% of GDP in the first quarter of 2008 to 130% of GDP in 2009 despite a lower contribution of private liquidity and a decline of economic activities in developed countries.

The second phase of global liquidity began roughly from early 2010, following monetary policy decisions of advanced economies to avoid recession**.** For this purpose**,** the Fed implemented the first quantitative easing (Q1) that consisted in acquiring 1.7 trillion dollars of toxic assets. During this phase, the global public liquidity component is influenced mainly by two factors including maintaining a zero rate policy over a long period (keeping the policy rates between 0% and 0.25% for the Fed, 1% for ECB, 0.5% for BOE and 0.1% for BOJ) with the objective of reassuring the financial markets. The second factor influencing the evolution of the global public liquidity component is the launch of a

quantitative easing program by monetary authorities in several advanced economies, especially in the United States (Q2 and Q3) and in the UK. Recourse to unconventional monetary policy was mostly conducted by the Fed, complemented by two more quantitative easing programs between 2010 and 2011 in order to self-finance US public debts (acquisition of 1 trillion public debts). By 2012, the Fed had engaged its third quantitative easing program (a purchase of 85 billion of assets per month) with the aim of keeping long-term interest rates at low level and promoting economic recovery. Regarding the private component of global liquidity; this component's main driver since early 2010 lies in the long-term investors' attitude in seeking for better yield prospects through bond market investments in emerging countries. In particular, Asian bond markets experienced large capital inflows that led to an increase in the share of foreign bondholders in local currency and in holdings of sovereign bond of international banks. These quantitative easing policies and global investors' behavior in the EME's bond markets contributed to the continuous rise of the global liquidity indicator during this second phase of the cycle. Hence global liquidity went from 130% to 133% of GDP G4 between the first quarter of 2010 and first quarter 2014, despite a decrease of 5% during 2010.



Sources: IMF, Macrobond and author's calculations

Figure 1: Global liquidity indicators and advanced economies GDP

II. Determinants of global liquidity

The global liquidity is mainly grasped through international capital flows (in the form of international credits and foreign currency lending) resulting from economic behavior in both issuing and receiving countries (Landau, 2013). Specifically, the interactions between the actors of private and the public sector (ECB, 2011) exert also an influence on changes in global liquidity. According to literature, the conditions of global liquidity depend on the interaction of three major factors: macroeconomic factors (growth, monetary policy, exchange rate regime, current account, etc.), regulation policy, and financial factors influencing the behavior of financial intermediaries (financial innovation, risk appetite).

1. Macroeconomic factors

Regarding macroeconomic factors, the monetary policy adopted by central banks is an important determinant of credit and money growth at domestic and global levels. It determines short-term interest rates and influences risk-free yield curves through expectations about the future evolution of policy rates. The risk free yield curves will in turn influence the interbank interest rates and asset prices, including risk premiums reflecting market specific risks, counterparty risks and risk appetite. The level of interest rates also affects the growth rates of private liquidity and liquidity conditions in the economy. Lastly, low long-term interest rates influence private liquidity growth by encouraging search for yield behavior in financial markets through incentives for cross-country activities and cross currency investment strategies. This situation can lead to over-optimistic risk perceptions and high-risk tolerance, which can lead to mispricing of assets.
An additional significant macroeconomic factor is the choice of exchange rate regime, in so far as they explain the transmission of monetary stimuli across currency areas. However, monetary impacts tend to differ depending on the exchange rate regimes. On one hand, flexible exchange rates mitigate the transmission of policy spillovers and reduce capital flows through exchange rates variations. In other words, previous mechanisms suggest that floating regimes limit the effects of global liquidity on receiving countries. On the other hand, countries with fixed regimes encounter more difficulties to face foreign currency's monetary policy stance, particularly in the context of international financial integration. Indeed, the exchange rate rule implies that authorities must manage official exchange

reserves in order to contain appreciation or depreciation pressures on the domestic currency. The important point is that unless such interventions are sterilized, they exert an influence on domestic monetary aggregates. In addition, as suggested by the Asian crisis in 1997-98, from the private agents' point of view, fixed regimes play as an implicit insurance against exchange rate risks, leading to accumulate open positions in terms of an active lending and borrowing. This situation may be a source of systemic risk if the currency peg is abandoned (Chang and Velasco, 1998). However, as recently stressed by Rey (2013) flexible regime does not fully isolate the country from the spillover effects due to foreign macroeconomic and liquidity conditions since there are strong international asset market linkages among advanced countries with floating currencies. Besides, it affects both fixed and flexible exchange rate regimes by amplifying surge of capital inflows causing credit growth and asset prices appreciation. The exchange rate regime factor is important to the extent that it may trigger or exacerbate financial boom–bust cycles. Overall, the degree of exchange rate flexibility may affect the strength and propagation of global liquidity spillovers on credit and liquidity creation in the receiving economies.

One of the significant factors affecting global liquidity conditions is global imbalances. Until 2014, we observed that there was widening of the current account deficit of the advanced countries, particularly the United States. On the other side, many emerging economies are experiencing current account surplus and build up large foreign exchanges reserves to prevent the appreciation effect of capital inflows on their exchange rate. Their investments strategies are based on buying low-risks instruments, such as US treasury securities or dollar deposits, leading to downward pressure on long-term interest rates. In view of the strong linkages between bond markets of the advanced economies, the low levels of interest rates in the United States also have a spillover effect in other major markets. These two effects combined, the widening of global imbalances and the feedback loop on asset prices and interests rates affect global liquidity conditions.

2. Financial regulation policies

Before the subprime crisis, regulation policy in advanced countries focused mainly on micro prudential supervision, which was essentially focused on bank solvability (Basle ratio). However, financial intermediaries are not subject to the same prudential regulation and there are regulation hierarchies between them; banks are the most subject to regulation, particularly after the global financial crisis.

These differences in supervision between financial intermediaries induce more risk taking behavior from the intermediaries that are less regulated (hedge funds, for instance). This behavior affects the global liquidity conditions through surges in private liquidity, principally produced by portfolio investment on the financial markets. Moreover, regulations and supervision differences across countries may be a strong determinant of global private liquidity growth in the advanced countries through the channel of cross-border activities. Furthermore, with the diversification of bank's activities and the emergence of financial conglomerates, global banks have circumvented the regulations through the securitization activity, which has permits to overcome the solvability requirements. This situation led to a strong credit growth during the pre-crisis period and induced the development of global private liquidity. However, since the crisis, coordinated efforts to reduce the scope for regulatory arbitrage could help mitigate these risks.

3. Financial factors

There are well-funded reasons for the existence of common global financial factors that affect individual country's private liquidity trends. According to BIS committee there are three financial factors that drive the global private liquidity conditions, which in turn affect the evolution of global liquidity.

First of all, financial integration promotes greater cross-border financing flows and facilitates access to new financial products across jurisdictions and countries. In addition, the degree of financial integration has an impact on global liquidity through the spillover effects of domestic liquidity into other economies. Over the last decades, financial markets in advanced economies and EME's have become better integrated at the global level, which has reduced information asymmetries. In turn, it enhanced cross-border financial flows and more importantly, increased the diversity of investors. These combined effects had a positive impact on global private liquidity conditions. At the same time, there has been a positive feedback effect as the increase of private liquidity[1] itself attracted new participants since the endogenic hypothesis of liquidity.

Second, financial innovation has brought new financial instruments that create new means of payment or enhance market liquidity trends. A major example of this liquidity enhancing effect of financial innovation is the securitization process that involves the transformation of illiquid assets into liquid assets via special purpose vehicle. So, the large

[1]Particularly market liquidity

cross border investments of global bank in securitized products illustrate how financial innovation may improve global liquidity conditions in a sense that it leads to an increase in risk sharing and hedging possibilities between the market participants, which in turn is a great incentive to increase transactions at a global level.

Third, market participants' risk appetite is the last financial factor that influences global liquidity conditions, especially its private liquidity components. The cyclic behavior of risk appetite is a well-known empirical regularity. Accordingly, sudden shifts in risk appetite or liquidity preference are associated with changes in leverage that can amplify liquidity cycles by intensifying liquidity surge during the upswing phase and liquidity shortage during downswing phase of the market cycle. The representative example of this fact is the expansion of international banking, which is closely correlated with fluctuations in attitudes towards risk. So, periods of rising risk appetite tend to be associated with swelling balance sheets, rising leverage and increasing dependence on short term funding, particularly wholesale funding, in the banking sector. When external shocks occur, it results in sudden withdrawal of the critical funding, and consequently concerns about liquidity rapidly become concerns about solvency. In this period of stress, market participants become more reluctant to transact with one another, it can be explained by their struggle to reduce their leverage in an environment of collapsing risk appetite, heightened counterparty risk and vanishing market liquidity which can amplify negative liquidity shocks. Moreover, this situation of market and funding liquidity shortages tends to correlate with surges in financial market volatility.

III. Global liquidity transmissions channels

In the previous sections, we argued that there are specific factors that explain the surges in global liquidity, but we did not investigate its consequences yet. From the financial stability perspective, the primary objective is to analyze the spillover effects of global liquidity from the perspective of receiving economies. Thus, it is important to clarify the theoretical framework behind the transmission channels for a better understanding of the global liquidity's impacts in the emerging economies, before implementing the empirical approach in the next section. There are two distinct transmissions channels that we are investigating in this analysis: the relation between global liquidity and asset price; then the relation between global liquidity and macroeconomic variables.

1. The impact on asset prices

The initial framework dedicated to spillover effects on receiving economies has been proposed by Baks and Kramer (1999). This paper focused on the case of advanced economies. They suggested the existence of two transmission channels: the “push” and “pull” channels considering the hypothesis of an accommodative monetary policy. This policy stance may open the way to liquidity spillovers at a global level.

First, the “push” channel would raise capital flows to foreign asset markets with better economic prospects through strong money and credit growth in the issuing country. This capital outflows would raise the demand for foreign assets and cause an upward pressure on asset prices and a downward pressure on interest rates in the receiving economies. Consequently, there would be a positive correlation between the money growth in the issuing country and the asset prices in the receiving economies and negative correlation between the money growth in the issuing country and interest rates in the receiving countries.

Second, the “pull” channel would depress foreign asset prices. The strong money growth and credit growth in the issuing country would raise the domestic asset prices and this evolution could attract foreign capital. If the foreign investors find the inflation in the asset prices in the domestic country as real and sustainable, it could attract reallocation of capital to the domestic country from abroad. These could trigger capital outflows from foreign countries and depress their asset prices. In this configuration, there would be a negative correlation between domestic money growth and foreign asset prices; then positive correlation between money growth and foreign interest rates.

Moreover, there are several factors affecting global liquidity conditions in the receiving economies such as exchange rate regimes, capital control policies and the main financial and trading partners of the receiving countries, all these factors contributing to the strength of the transmission channels.

2. The impact on macroeconomic variables

In this section, we investigate the effects of global liquidity on both financial variables, such as asset prices and interest rates, and macroeconomic variables particularly the effects

on receiving economies output[2]. There are various transmission channels through which monetary decisions and global liquidity conditions can be transmitted to domestic output. Since these transmission processes possibly yield an intermediary role for asset prices, it is interesting to explore the effects of global liquidity expansion on the output of the receiving economies.

The first assumption we need to remind for this analysis should be the "long run neutrality of money" which explains why a monetary shock will not have a significant effect on real output. However, there is a consensus regarding its significant impact on economic activity in the short and medium run. According to Ruffer and Stracca (2006) the relevant frameworks for excess liquidity spillovers are focused on the Mundell-Fleming framework and the New Open Economy models.

The Mundell-Flemming model[3] is the initial framework analyzing international monetary transmission. In case of flexible exchange rates and substitutable goods, an expansionary monetary shock in the country leads to a reduction of the interest rates; this leads to the depreciation of the currency through the capital outflows in the country. As a result, there is a rise in demand for domestic goods that increases the country output[4]. On the contrary, the impacts of the country A's monetary policy in the country B are negative in a way that it will contract their output and as the money is an exogenous variable, no direct quantity spillovers will occur. However, there might be cases where the monetary expansion in the issuing country A has positive impacts on the country B but through indirect transmissions mechanisms. In the country B, monetary authorities may reacts to the contraction of their output by injecting more money into the system to support their economy. It may create a positive correlation between countries A and B quantity of money and may have a positive correlation between country A's money and country B's output. The fixed exchange rates case is much simpler because the spillover operates directly through the monetary authority's reactions of the receiving country B, which is determined by their desire to keep the exchange rates fixed.

In the new open economy model[5], an expansionary monetary policy in the country A can affect the foreign country B output developments in a positive way. A positive liquidity shock in the issuing country will cause a depreciation of their exchange rate, which leads to

[2]In the financial stability hypothesis, we only focus on the effects of global liquidity on assets prices and in a lesser extent on economic activity. The monetary policy perspective gives a better framework to study the effects of global liquidity on price and inflation.

[3]We consider two countries: the domestic country A and the foreign country B

[4]Expenditure switching effect

[5]Obstfeld and Rogoff (1995), Kollmann (2001)

demand shift away from foreign goods. Since these models assume nominal rigidities and possibilities of intertemporal substitution, stronger inflation expectations arise in the domestic country A and the foreign country B. Furthermore, the real interest rates fall in both countries, which lead to a shift from future to present demand, (as the present goods are cheaper relative to future goods and assets). This situation leads to strong correlation between domestic money growth and output growth in both domestic and foreign countries. In other words, an expansionary monetary policy in the domestic country A affects positively the output developments of both countries. However, some effects can mitigate the correlation effects between domestic liquidity and foreign output. The foreign monetary authorities might undo the inter-temporal switching effects and the expenditure switching effects by endogenously reacting to domestic consumer prices, which are affected by exchange rates evolutions.

IV. The spillover effects of global liquidity expansion: An empirical investigation on emerging economies

In this section, we investigate the spillover effects of global liquidity expansion on EME's. In order to assess the global liquidity effects on these countries, we adopt an empirical approach based on VAR methodology applied to Panel data (PVAR). Nevertheless, before implementing the empirical approach, we investigate the related literature regarding the global liquidity topic.

1. Literature review

Global liquidity is a recent research field pioneered by Baks and Kramer (1999) who introduced prices and quantity liquidity indicators to assess their impacts on economic variables - such as asset prices and equity returns - in receiving economies. Their results confirmed the effects obtained in the past studies working on the effects of liquidity expansion on asset prices at a country level initiated by Friedman (1968). Specifically, Baks and Kramer (1999) - by considering only the public component of the global liquidity - identified strong positive relationships between the expansion of global liquidity and the growth in asset prices and equity returns during the period.

This pioneering study started a new topic focusing exclusively on the effects of global liquidity in the issuing and receiving countries and the development of theoretical

framework explaining its evolution. Initially, the early works on the subject were only interested if the effects of this global liquidity in developed countries. Ruffer and Stracca's (2006) paper was the first to investigate spillover effects on receiving economies by using a Global VAR (GVAR) model. Their main results focused on the significant effects of global liquidity's expansion on financial variables in the euro area and on a lesser extent on Japan's financial variables. This study also showed that excess liquidity is an indicator of inflationary pressures in these economies. Bracke and Fidora (2006) test different hypotheses that may explain the current trend of global imbalances characterized by development of current account imbalances in developed countries, especially in the United States, the decline in long term interest rates and rising asset prices through the use of a structural VAR model (SVAR). The authors propose to test three hypotheses to explain these empirical observations: the global saving-glut, the global liquidity glut and investment strike. Their results exhibited positive evidences of the effects of global liquidity glut as possible explanation of the increase of current account imbalances in the developed countries. Sousa and Zaghini (2004) considered the impacts of global liquidity on macroeconomic variables by using the real GDP as an indicator of output level on the receiving economies, the exchange rates and domestic prices. They estimated a SVAR model to analyze how the euro area variables react to a foreign monetary expansion with liquidity indicator of the G5 countries as a proxy; they found significant effects of global liquidity expansion explaining fluctuations in prices and output in the euro area.

While, the consequences on developed countries have been largely investigated in the empirical literature, studies on emerging economies are scarcer and represent an interesting field of research. IMF (2010) have produced references papers on this topic. They examine the determinants of capital flows to emerging markets. These capital flows can be explained by economic opportunities offered by these countries or by the global excess liquidity inflow. Through a panel regression, the IMF highlights the role of global liquidity's expansion in the rises of asset prices and equity returns experienced by those countries. They also showed that changes in these financial variables are explained by developments in both global liquidity and changes in the local money supply in those emerging economies. Finally, their paper highlights the role of exchange rate regimes in the transmission of the global liquidity and the exchange rates regime may trigger the accumulation of foreign exchange reserves as an indirect effect of the liquidity inflows. Tao and Psalida (2011) study completes this first approach by introducing new financial variables such as bank lending and new global liquidity indicators. Their results are similar

to the previous study and conclude on the existence of positive links between global liquidity's expansion and asset prices; and between the evolution of global liquidity and the accumulation of foreign reserves in emerging countries. Their main findings conclude on the positive correlation between global liquidity expansion and credit growth in the receiving economies and between global liquidity expansion and equity returns in the receiving economies. Another significant paper on this topic was developed by Chudik and Fratzscher (2011), which include the traditional assumptions on global liquidity and introduce new kinds of shocks via liquidity shock and risk shock in the explanation of the global transfer during the global financial crisis. They test the impacts of these shocks by using a global VAR (GVAR) model on a set of developed and emerging countries. They conclude on the heterogeneous effects of these shocks as developed countries are highly vulnerable to liquidity shock while emerging countries are sensitive to shock risk and less vulnerable to a liquidity shock. Brana and Prat (2011) estimate a panel regression analysis by introducing a threshold effect to assess the evolution of asset prices in emerging countries and they use as threshold variable the investors risk aversion**.** Their results are consistent with the empirical literature, but they demonstrated the existence of a non-linear effect in the relationship between global liquidity and the evolution of asset prices depending on risk level. Specifically, when levels of risk aversion are low, the positive relationship between the evolution of global liquidity and asset prices is significant; this effect disappears when level of risk aversion increases especially during the period following the financial crisis. Djigbenou (2014) investigates the impacts of global liquidity on asset prices of emerging economies using the Panel VAR (PVAR) methodology. The contribution of the paper focuses on the inclusion of variable that models the evolution of house prices. The author concludes on the mixed effects of global liquidity expansion on asset prices, but she found that these effects are significant for the evolution of consumer prices and GDP growth.

2. Data

For the purposes of this analysis, we built an unbalanced panel data composed of 30 countries divided into two groups, liquidity issuing economies represented by several advanced economies[6] and receiving economies mainly composed of emerging countries[7].

[6] Issuing economies : United States, Japan, Euro area, United Kingdom.

Those receiving countries are also decomposed into four country groups from Asia, Latin America, Eastern Europe and lastly Africa and the Middle East. This distinction will be important for modeling the global liquidity spillovers at a regional level. To construct our database, we needed to collect:

- Official liquidity indicators, including broad money M2 and narrow money M1.
- Indicators of performance on financial markets with MSCI index. This indicator has the benefits to be harmonized and available for all the countries including emerging economies.
- Indicators of interest rates modeled by treasury bonds rates for long-term interest rates and interbank rates, discount rates and money market rates for short-term interest rates.
- An indicator modeling the domestic output with the industrial production index.
- Exchange rates between US dollars and local currencies in order to express all variables in the same currency.

These data are collected from January 2000 to May 2014 in monthly frequency from the IMF, Datastream and Macrobond database.

3. Data preliminary conversion

First, some data require preliminary treatment before estimating our models. Indeed, in addition to the necessary transformation in the same currency, a frequency transformation is also necessary. It turns out that Industrial production index data are available only in quarterly frequency in some of the countries of our panel. This situation requires the linear interpolation method to transform them into monthly data. This first step allows the creation of our six variables of interest namely GL global liquidity indicator, liquidity indicators in receiving countries $M2$ (or $M1$), IPI represent the short-term GDP, the indicator of assets prices $MSCI$, long term and short term interest rates with ILT and h IST. Then, we perform a logarithm transformation on our variables of interest.

Second, contrary to previous work on the subject, we choose to undertake a panel unit root test procedure. The results[8] of this methodology conclude on the presence of the unit root for all of our variables in level. This unit root is then removed using the first difference on

[7]Receiving economies: China, India, Indonesia, South Korea, Malaysia, New Zealand, Philippines, Singapore, Taiwan, Australia, Thailand, Bulgaria, Hungary, Lithuania, Poland, Czech Republic, Russia, Argentina, Chile, Colombia, Mexico, Peru, Egypt, Israel, Jordan, South Africa.

[8]See annex p.46

all our variables. So, in order to perform the Panel VAR procedure we choose to use stationary variables.

4. Methodology

4.1. Panel VAR approach

To demonstrate the effects of global liquidity on our panel of emerging countries, we adopt the VAR methodology developed by Sims (1980) applied to panel data according to the empirical methodology developed by Love and Zicchino (2006). We choose this empirical methodology considering Canova's (2013) recommendations on the Panel VAR model. First, we rely on the PVAR methodology to highlights the transmission of idiosyncratic shock across countries and time; in our case, we rely on this methodology to investigate the effects of the global liquidity's expansion in the advanced economies and its impacts on a group of heterogeneous emerging economies. Second, this approach is also suited for investigating what channel of transmission may make responses to internationals shocks across heterogeneous group of countries, particularly we investigate which transmission's channels could explain the evolution of domestic variables in the receiving economies. Third, it is also suited for examining whether the shocks generated outside an area dominate the variability of domestic variables (Canova, 2005; Rebucci, 2010).
The theoretical reduced form of the PVAR model is defined by:

$$Y_{i,t} = \propto_i + \Gamma(L) Y_{i,t} + \varepsilon_{i,t} \quad (1)$$

Where i $(i = 1, \dots, N)$ denotes the country, and t $(t = 1, \dots, T)$ the time. $Y_{i,t}$ represents the vector of endogenous stationary variables, $\Gamma(L)$ the matrix polynomial in the lag operator L, $\propto_i$ denotes the vector of country-fixed effects and $\varepsilon_{i,t}$ is the vector of errors. The indicator of global liquidity and the variables of the receiving economies compose the vector of the endogenous variable: $Y_{i,t}$.
Concerning the empirical methodology, we follow the recommendations made by Love (2006) when implementing the PVAR procedure. This methodology requires imposing the same underlying structure for each cross-sectional unit (country) but this constraint may be violated in practice. The country-fixed effects introduced in the Equation (1) are the solutions to get around this restriction on the parameters so they can capture individual

heterogeneity. However, theoretically the fixed-effects estimator in autoregressive panel data models is inconsistent because the fixed effects are correlated with the regressors due to lags of the dependent variable (Nickell, 1981). To overcome this issue, we need to remove the fixed effects before estimating the coefficients by using generalized method of moments (GMM) or ordinary least squares (OLS) estimations. The GMM method needs the Helmert procedure recommended by Love to remove the fixed effects but we use an alternative method to resolve the fixed effects by differencing our variables as the first first-difference method removes the panel fixed effect. However, this choice creates a new issue, in practice, as the PVAR procedure needs the results of the Helmert procedure for the estimation. So, we perform OLS estimation for our PVAR models to overcome the previous technical issue as the OLS estimation use our variables in first difference as both regressors and instruments to estimate the panel VAR coefficients. Specifically, we use Pooled OLS VAR without fixed effects as these effects provide biased estimates of autoregressive coefficients (Juessen and Linneman, 2010).

4.2. Ordering the endogenous vector

Regarding the order of our endogenous variables, we use both Cholesky and results[9] from the panel non-causality tests. We specify the Cholesky ordering from the theoretical relationship between our variables and justify the order's choice by using the panel non-causality tests results.

First, we assume that the most exogenous variable of our model is the global liquidity indicator since it is created in the issuing countries. Second, a surge in global liquidity is first transmitted to money supply, which in turn affects the output of the receiving economies. At the same time the asset prices and the long-term interest rates are also affected by the evolution of the money supply, which indicate that the money supply is the most endogenous vector of our model. Furthermore, the evolution of interest rates affects theoretically the evolution of asset price so we conclude that the asset price is less endogenous than the interest rates. Lastly, the long-term interest rates affect the short-term interest rates.

From an empirical perspective, the main results from the panel non-causality tests confirm the important bi-directional causality link between all of our variables. Our results show that most of our variables interact with each other in a positive way. In other words, each

[9]See annex p. 44-45

variable homogeneously causes the developments of the other variables of the endogenous vector. However, only two non-significant results emerge from the causality test of production to the money supply and the causality test of long-term interest rates to the asset price, which indicates that these variables are more exogenous compared to short-term interest rates, production, and asset prices. Nevertheless, these results are not strong enough to determine the order choice of our variables and since most of our variables face bidirectional causality, we cannot conclude on a stable order for our endogenous vector. So, we rely on the theoretical indications and define the vector of endogenous variables as:

$$Y_{i,t} = \left(\Delta GL_{i,t}; \Delta M1_{i,t}; \Delta OUTPUT_{i,t}; \Delta MSCI_{i,t}; \Delta i_{i,t}^{st}; \Delta i_{i,t}^{lt}\right) \quad (2)$$

5. Empirical analysis

To evaluate the effects of global liquidity expansion on emerging countries, we first focus on the analysis of a benchmark model that regroups all emerging economies in our database; second, we investigate the effects at a regional level and third, we investigate those effects depending on the exchange rate regime of the countries in our database. This main approach centers on the impacts of the first indicator of global liquidity we constructed before, which only measure the expansion of the global liquidity created by advanced economies throughout the given period. Additionally, we study the effects of global liquidity under the assumption of global excess liquidity implemented in the second indicator as a robustness analysis that we use this indicator only on the global model.

Since our variables are in first differences, our analysis is centered on the growth rate of those variables. For further analysis, we construct our reasoning on the impulse responses functions (IRFs), which allows examining the responses of a liquidity shock on the endogenous variables of the selected model, and the results of the variance decomposition through variation of each variable explained by the indicator of global liquidity. For every estimation, we use a 5% standard error bands generated with Monte-Carlo 1000 repetitions and we rely on a second order PVAR for our estimations considering the recommendations of empirical studies using monthly data and the Schwarz information criterion[10].

5.1. Benchmark model

[10] see annex p.33

In the first model (figure 2 and table 1), we investigate the impacts of global liquidity expansion in the advanced economies on all receiving countries of our panel. We find that a positive shock of global liquidity has a positive significant effect on the evolution of money supply in emerging countries, especially during 3 months after the shock. Moreover, this transmission of global liquidity conditions in the receiving economy results in a relative increase in industrial production leading to a positive growth of the receiving economies output. These results are consistent with the effects of an expansionary monetary policy under the new open economy models theory, as the surge in global liquidity affects both monetary aggregates and output in receiving economies. However, as we cannot distinguish the individual effects of the liquidity expansion on each country, we cannot conclude on the monetary authority reactions. Their reactions could also explain the positive relation between global liquidity growth and foreign output growth if they increase their available money to reacts to the contraction of their output as explained in the M-F framework. These results are in line with the findings of Sousa and Zaghini (2004).

In addition, the global liquidity shock causes a decrease in interest rates only during a short period as the effect disappears quickly. This transitory effect on interest rates influences the appreciation of asset prices in the receiving countries with the transmission of the global liquidity flows to emerging financial markets. Furthermore, the results on short term interest rates are interesting since a decrease in short term interest rates could be explained by monetary authorities reactions by adjusting their key interest rates (central banks' policy rates), which in turn influence the short term interest rates (money market interest rates and discount rates). These consequences on interest rates and assets prices are consistent with the "push" channel described by Baks and Kramer (1999) and the findings of Ruffer and Stracca (2006) and Bracke and Fidora (2006). In addition, these results are consistent with the findings of the numerous empirical studies, for instance the results of Djigbenou (2014) about the response of output in the receiving economies.

Finally, the variance decomposition analysis confirms the previous IRFs results and settles that only a small percentage of the global liquidity shock innovations explain the development of endogenous variables. The strongest effect concerns the money supply (7.1%) whose evolution is explained by expanding global liquidity.

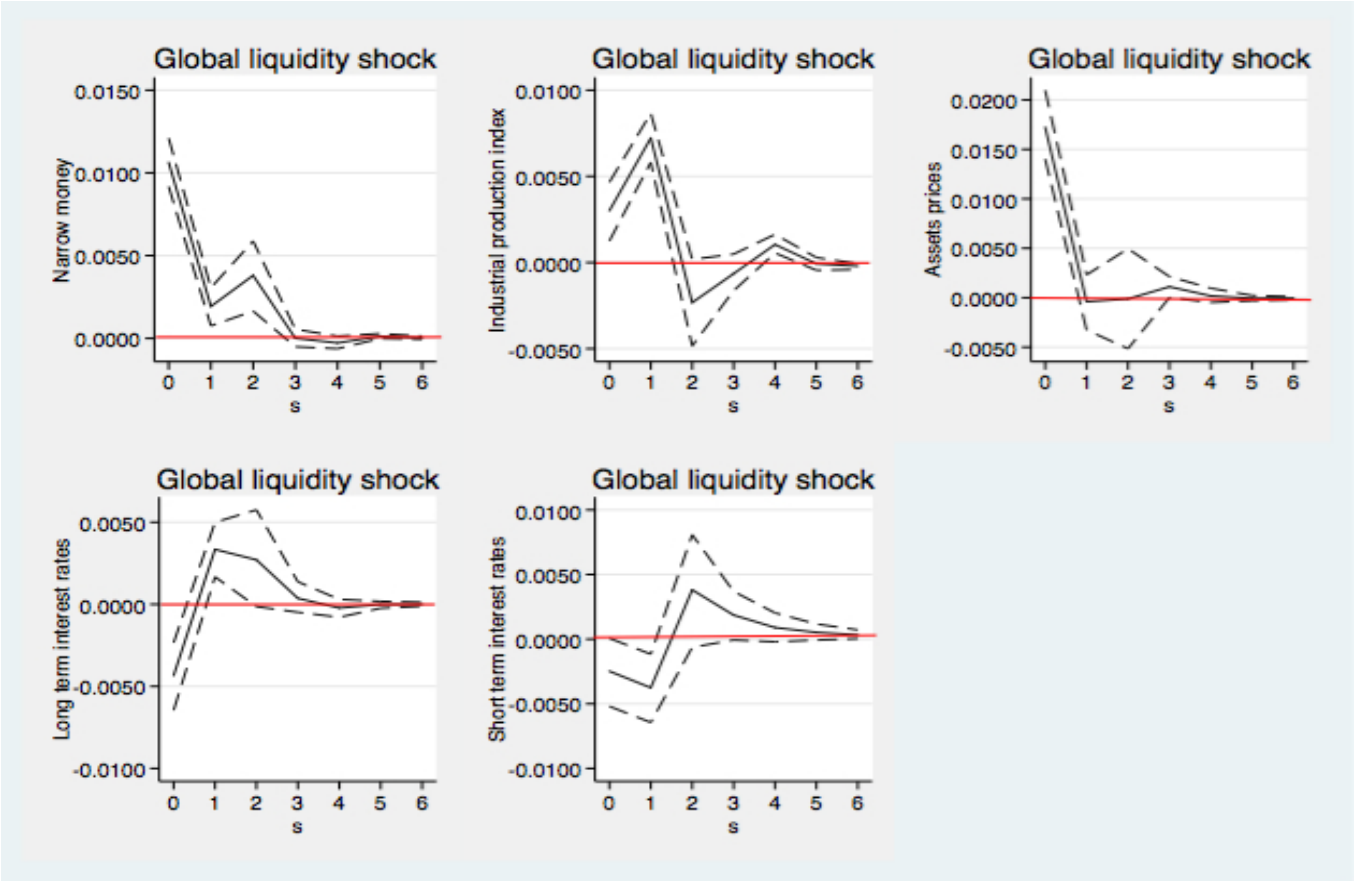


Figure 2: Benchmark model Impulse responses functions

	1 months	3 months	6 months
M1	6.0	7.1	7.1
IPI	0.2	0.9	1
MSCI	2.5	2.5	2.5
ILT	0.2	0.6	0.6
ICT	0.09	0.4	0.4

Table 1: Variance decomposition: percent of variation of the row variable explained by the indicator of global liquidity

5.2. Regional models

In this section, we study the effects of global liquidity at a regional level[11] to reveal the disparities between country groups according to their geographical origin or economic area that they belong.

[11] See annex p.34-37 for the IRFs and variance decomposition results for the regional models

5.2.1. Asia Pacific region

The impacts of global liquidity in Asia-Pacific countries[12] (figure 3) follow the results of the global model. However, small differences in the magnitude of these effects on the receiving countries are noticeable. Indeed, there are larger magnitudes on the evolution of interest rates and particularly the significant effect on output. These differences can be explained by region specificities, particularly regarding the Asian countries that are more responsive to changes in the evolution of global liquidity conditions. This significant effect could be explained by the fact that Asian emerging economies are countries that historically receive direct foreign investment and capital flows. The effects on receiving countries money supply could also be explained by their exchange rates management as most of the countries use intermediate or fixed exchange rate regimes. So a surge in global liquidity will be transmitted to the money supply of the receiving economies and increase the foreign exchange reserve in case intermediate flexible exchange rates or will be integrally transmitted to their foreign exchange reserve as they try to maintain the fixed exchange rates.

The variance decomposition results (table 2) are also interesting because contrary to the benchmark model, the global liquidity shock have a better explanatory power in the Asian-Pacific model. The global liquidity shock explains 3.6% of assets prices innovation while this share was roughly around 1% in the benchmark model.

5.2.2. Eastern Europe region

We find the same variables responses (figure 4) as the benchmark model on the countries[13] of the Eastern Europe region, especially larger amplitudes concerning the variables evolution after the global liquidity shock. Moreover, Eastern Europe money supply reacts strongly to a positive shock on global liquidity that can be explained by the "push" channel of global liquidity. Moreover, this strong money growth in the receiving countries put a weak relative downward pressure on long term interest rates as confirmed by the variance decomposition (table 3) (2%) and the upwards effects on the assets prices are relatively limited as exhibited by the variance decomposition (1.5%). However, this strong money growth affects strongly the

[12]Asia-Pacific countries : China, India, Indonesia, South Korea, Malaysia, New Zealand, Philippines, Singapore, Taiwan, Australia, Thailand.

[13]Eastern Europe countries: Bulgaria, Hungary, Lithuania, Poland, Czech Republic, Russia,

output in the receiving economies as 10% of its evolution is explained by the global liquidity shock innovations. This result is consistent with the transmission channel of NOE models.

5.2.3. South America region

Relative to the benchmark model, Latin American countries[14] exhibit important differences in the consequences of the global liquidity expansion (Figure 5). Despite similar effects on changes in asset prices and output, we notice that the money supply of these emerging countries is very sensitive to the global liquidity inflows. Specifically, the variance decomposition suggests that liquidity shock explains 10% of innovation in the money supply. This explanatory power (table 4) is also evident concerning the production with 21% of the innovation of this variable explained by the global liquidity shock. The significant effects on domestic monetary growth mostly drive the output improvement in the South America economies and spills to the asset prices. However, the effects on the interest rates are less significant as their innovations are only explained by less than 2% of the global liquidity shock.

5.2.4. Middle East and Africa region

As expected, results of this group[15] are mitigated (figure 6). Indeed, we do not notice any significant effect of global liquidity shock on the evolution money supply and interest rates, despite significant results concerning the evolution of output and asset prices according to the variance decomposition (table 5), respectively 21% and 2%. These results are not consistent with expected effects of global liquidity expansion and one possible explanation might be that their financial markets are less integrated than other emerging countries and regions.

5.3. Exchange rates regimes

We investigated in the previous theoretical framework that the effects on the receiving economies depend on several macroeconomic factors, including the exchange rate regime of these countries. The global liquidity's surge consequences may be different based on the nature of the exchange rates regimes of the receiving countries, especially depending on its

[14] South American countries : Argentina, Chile, Colombia, Mexico, Peru
[15] Middle East and African countries: Egypt, Israel, Jordan, South Africa

degree of flexibility and the level of control over capital flows. These effects can be summarized through the opposing cases of the fixed exchange rates and floating exchange rates regime.

To highlight the influence of the exchange rate regime, the countries in our sample are divided into two subsamples, countries with fixed exchange rates regime and countries with floating exchange rates regime. To this end, we use the de facto monthly coarse classification developed by Reinhart and Rogoff. This classification covers only a part of our period, yet we apply the average and the median[16] to distinguish the countries exchange rates regime from January 2000 to December 2010. Consequently, when the median during the period is between 1 and 2 or the average is between 1 and 2.5, the country is placed in the fixed exchange rate regime group[17], which consists of 13 countries. Finally, countries with a median between 3 and 6 or an average of between 2.51 and 6 during the period are included in the floating exchange rate regime group[18], which is composed of 13 countries.

5.3.1. Empirical results

The main results[19] of this empirical approach considering the exchange rates regime join the results of the benchmark model but dividing our countries in two groups allows us to interpret the results differently. First of all, a global liquidity shock on the monetary conditions indicator produce similar effects on both countries groups when we use narrow money as proxy for monetary conditions. However, taking into account the exchange rate regime can complete the previous analysis.

Firstly, we find that countries with fixed exchange rates regime are particularly sensitive to monetary policies of the issuing countries (figure 7) as we notice significant effects of the global liquidity shock on the monetary conditions in the receiving economies. This result is consistent with theoretical assumptions according to which fixed exchange rate regime does not isolate the receiving countries from evolutions in monetary policies of issuing countries. Furthermore, contrary to the benchmark model, we also find significant effects on the evolution of monetary conditions with the model using broad money (figure 8); it

[16] See annex p.48

[17] Countries with fixed exchange rate : Argentina, Bulgaria, China, Egypt, India, Hungary, Jordan, Lithuania, Malaysia, Peru, Philippines, Russia, Taiwan

[18] Countries with floating exchange rate : Thailand, Singapore, South Africa, Czech Republic, Poland, New Zealand, Mexico, Korea, Israel, Indonesia, Australia, Chile, Colombia.

[19] See annex p. 38-41 for IRFs and variance decomposition results

highlights the fact that the global liquidity affects not only the public components of the monetary conditions, but it affects also the behaviors of the private sector, by stimulating the credit creation for instance. However, we cannot distinguish properly the effects on the private liquidity of the receiving economies in this model, as we cannot differentiate between the public and private liquidity in the monetary conditions indicator.

Secondly, results concerning countries with floating regimes show that the exchange rate does not protect those countries from the expansion of the global liquidity. This result is in line with Rey (2013). Indeed, regarding the first model using narrow money as monetary indicator (figure 9), we note that the evolutions of the variables of this group of receiving economies are significant to the global liquidity shock. In addition, no significant mitigating effect related to the fluctuation of exchange rates is observed. Finally, although variables of the second model using broad money (figure 10) are sensitive to changes in global liquidity, the indicator of monetary conditions is not affected by the global liquidity shock. This result moderate our analysis about the behavior of the private sector, as the private liquidity is not stimulated by the developments of the global liquidity conditions. In other words, it means that the global liquidity effects do not affect the behavior of the financial intermediaries and the credit creation in this group of countries.

Thirdly, the interpretation of these results is reinforced by the corroboration of Rey (2013) hypothesis, which states under hypothesis of perfect capital mobility that the exchange rate regime is not important considering the global financial cycles. The appreciation effects of asset prices and private liquidity creation, which we showed in the case of the fixed exchange rates regime, are representative of Rey's assumptions and are the effects of the developments of the global liquidity conditions.

6. Robustness check

In this section, we investigate the spillovers effects of global liquidity on the emerging economies under the assumption of global excess liquidity in the issuing countries. We rely on the GDP weighted global liquidity indicator[20] developed by Ruffer and Stracca (2006) to assess the results obtained with the first global liquidity indicator. The hypothesis of global excess liquidity in the advanced countries implies that only the excess liquidity

[20]Ruffer and Stracca (2006) use two indicators to express the hypothesis of global excess liquidity : $\log \frac{M3_t}{PIB_t}$ the monetary aggregate M3 weighted by the GDP and $\Delta \log \frac{M3_t}{PIB_t}$ the growth rate of the monetary aggregate M3.

affects the receiving economies and developments of global liquidity conditions may only affect the receiving economies at a limited degree.

We adopt the same underlying methodology than in the previous section; the only difference being the nature of the global liquidity indicator implemented in the panel VAR. We focus on the spillover effects of the excess global liquidity on the global model to analyze the differences between the effects of the global liquidity indicators.

The excess global liquidity shock pushes the same mechanisms[21] obtained in the first global model. We notice that the global liquidity shock causes strong money growth, asset prices appreciation and downward pressure on interest rates. The only differences rely on the magnitude of the global liquidity effects as we notice a weak effect on the output and a strong significant effect on the short-term interest rates. The transmission mechanisms are similar to those of the first global model, strong money growth and fall of interest rates, especially long term interest rates, influences the increase of the asset prices through the "push" channel. In turn, the receiving economies output is affected by the money growth, which could be provoked by monetary authorities reaction to the surge of global liquidity or the effect of global liquidity in the NOE framework.

The analysis is confirmed by variance decomposition (table 10) results, with a relatively strong effect of the global excess liquidity shock on the innovations of the money growth (6.1%), the asset prices (3.7%) and the short-term interest rate (3.9%). Except, the strong result on short-term interest rates, which normally is influenced by the evolution of the long-term interest rates though these results agreed with the findings of the first global model.

Conclusion

Since the late 90's, the global liquidity development and its issues on both issuing and receiving countries have captured the attention of economists and the financial macroeconomic literature over the recent years. The debates have been mainly focused on the destabilizing effects of the global liquidity since its components evolutions, official and private liquidity, could had led to the 2008 financial crisis. Moreover, the policies responses to mitigate the crisis effects are also in the center of this topic since the quantitative easing and accommodative monetary policy fueled the evolution of the global liquidity. So, in order to investigate the consequences of global liquidity, one strand of the

[21] See annex p.42 for IRFs and variance decomposition results

literature focused exclusively on the spillovers effects to the receiving economies, mostly advanced countries. The studies investigating the effects on emerging countries are scarcer mainly because of data availability reason. In this context, the primary objective of this paper is to examine the theoretical transmission channels and the consequences of the evolution of the global liquidity conditions on the emerging countries. We focus on the effects on specific emerging countries variables such as money supply, asset prices, interest rates and more importantly output. For this purpose, we estimate a panel VAR model on a sample of 30 countries over the period from January 2000 to May 2014.

Our main results are consistent with the hypothesis of destabilizing effects of the global liquidity to the emerging countries. From a financial stability perspective, a surge in global liquidity triggers the emerging economies money growth, drives downwards pressures on the interest rates and upward pressures on asset prices. These findings are in line with Baks and Kramer (1999) and studies focused on emerging countries, especially FMI (2011) and Djigbenou (2014). However, contrary to the papers working on spillover effects of global liquidity, we showed that there are different effects between the emerging countries groups. Some groups are more affected by the global liquidity conditions than others, Asian countries and European countries for instance. Moreover, we find a significant positive correlation between the global liquidity and the output of emerging countries, which is line with the previous results on the topic (Souza and Zaghini, 2004). This result confirms that a surge in global liquidity improves the output development in the receiving economies and we demonstrate the existence of disparity among the countries groups. Finally, distinguishing the emerging countries based on the exchange rate regime revealed that according to Rey (2013) hypothesis, the choice of the exchange rate regime does not matter as the emerging countries are all affected by the global liquidity expansion.

Our contributions to the debate are mainly centered on the financial stability perspective. But in order to measure all the different characteristics of global liquidity, we need to examine the impacts of global liquidity conditions on prices (consumer prices and commodities prices) and inflation under a new approach, the monetary policy perspective.

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APPENDIX

A. PVAR model optimal lag determination

1. Benchmark model

Lag = k	Schwartz information criterion
k = 0	-17.97949
k = 1	-18.16101
k = 2	-18.16403*
k = 3	-18.13857
k = 4	-18.08803
k = 5	-18.02969
k = 6	-17.99225
k = 7	-17.96245
k = 8	-17.90152

We choose the optimal lag minimizing the Schwartz information criterion, in our case we select k = 2.

B. Impulse response function and variance decomposition

1. Regional model

a. Asia-pacific region

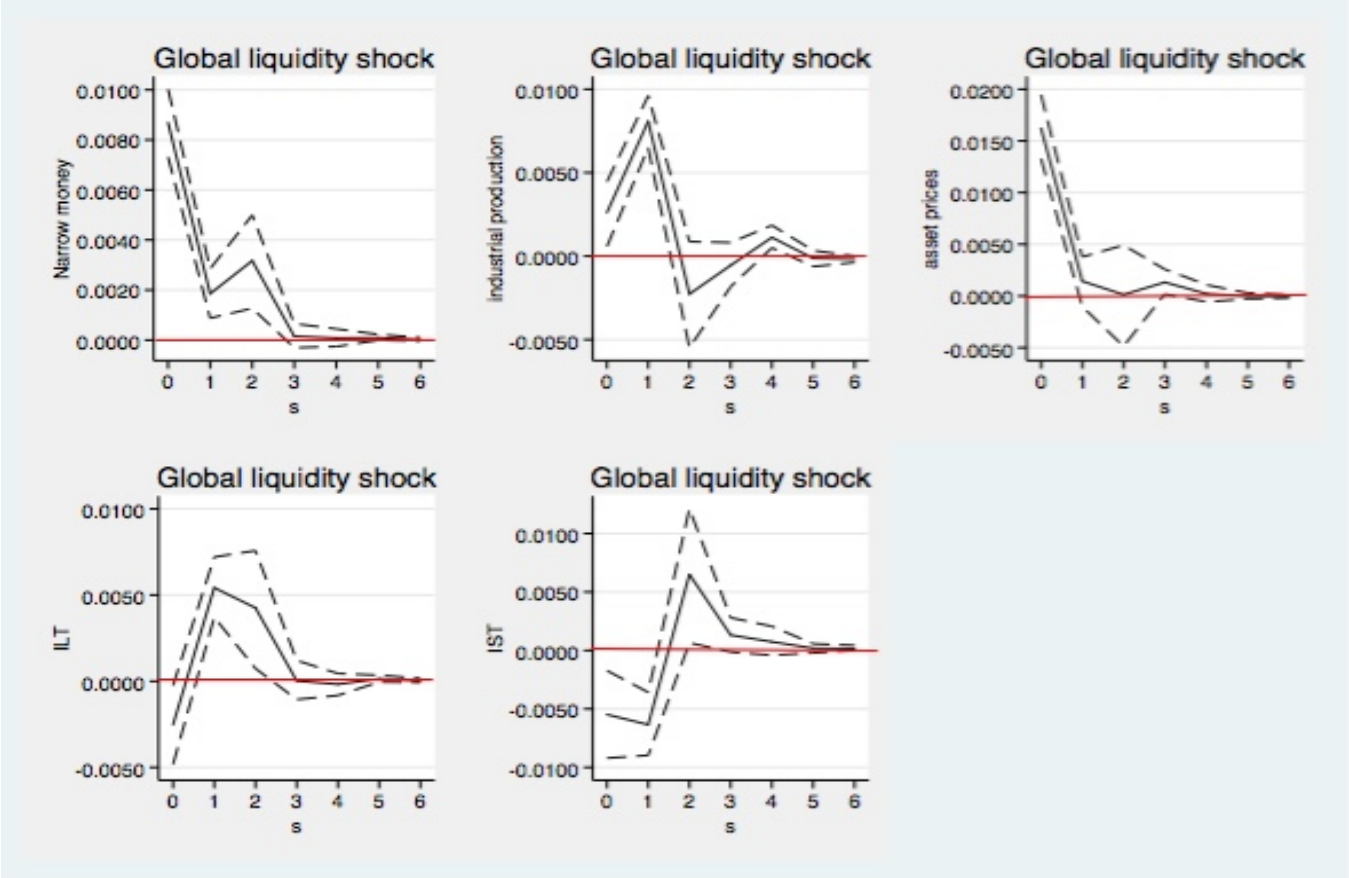


Figure 3: IRFs Asia pacific

	1 months	3 months	6 months
M1	6.1	7.0	7.0
IPI	0.2	2.5	2.6
MSCI	3.7	3.6	3.6
ILT	0.1	1.4	1.4
ICT	0.03	1.1	1.1

Table 2:Variance decomposition

b. Eastern Europe reagion

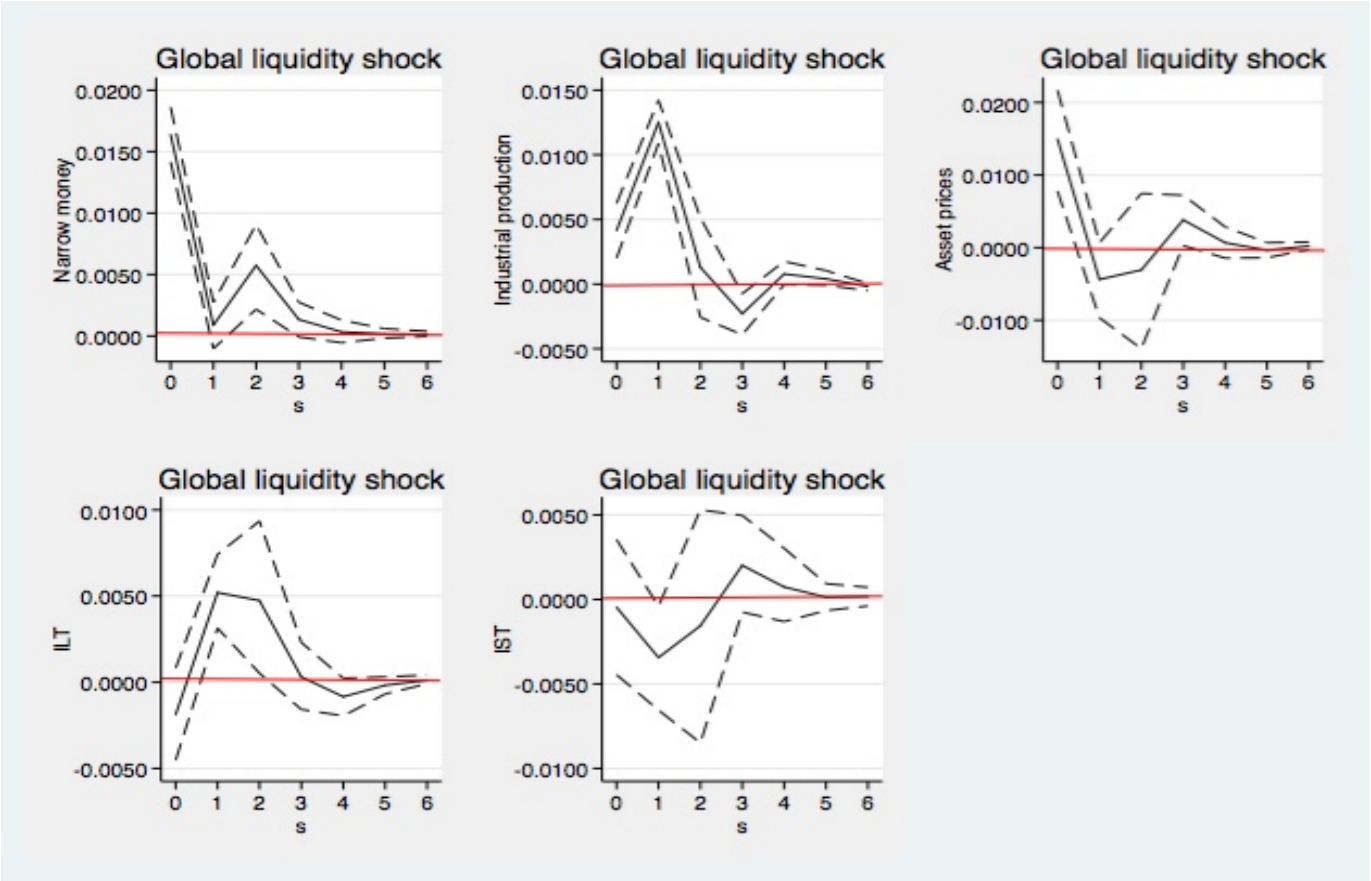


Figure 4: IRFs Eastern Europe

	1 months	3 months	6 months
M1	15.1	15.8	15.8
IPI	1.1	9.7	10.0
MSCI	1.3	1.4	1.5
ILT	0.1	2.0	2.0
ICT	0.003	0.2	0.2

Table 3: Variance decomposition

c. South America region

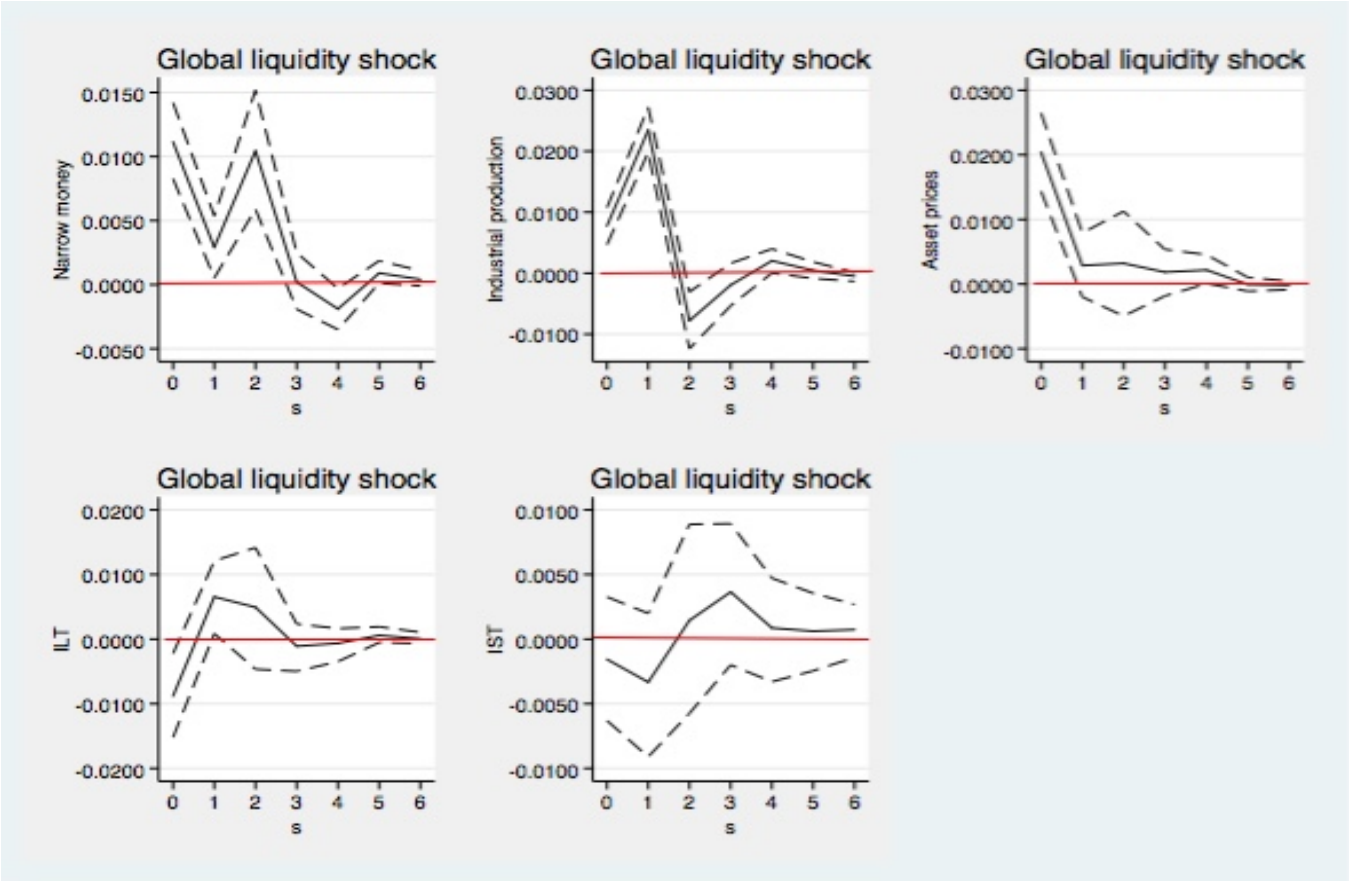


Figure 5: IRFs South America

	1 months	3 months	6 months
M1	5.8	10.1	10.2
IPI	2.9	21.5	21.5
MSCI	4.9	5.0	5.0
ILT	0.9	1.6	1.6
ICT	0.04	0.2	0.3

Table 4: Variance decomposition

d. Asia-pacific region

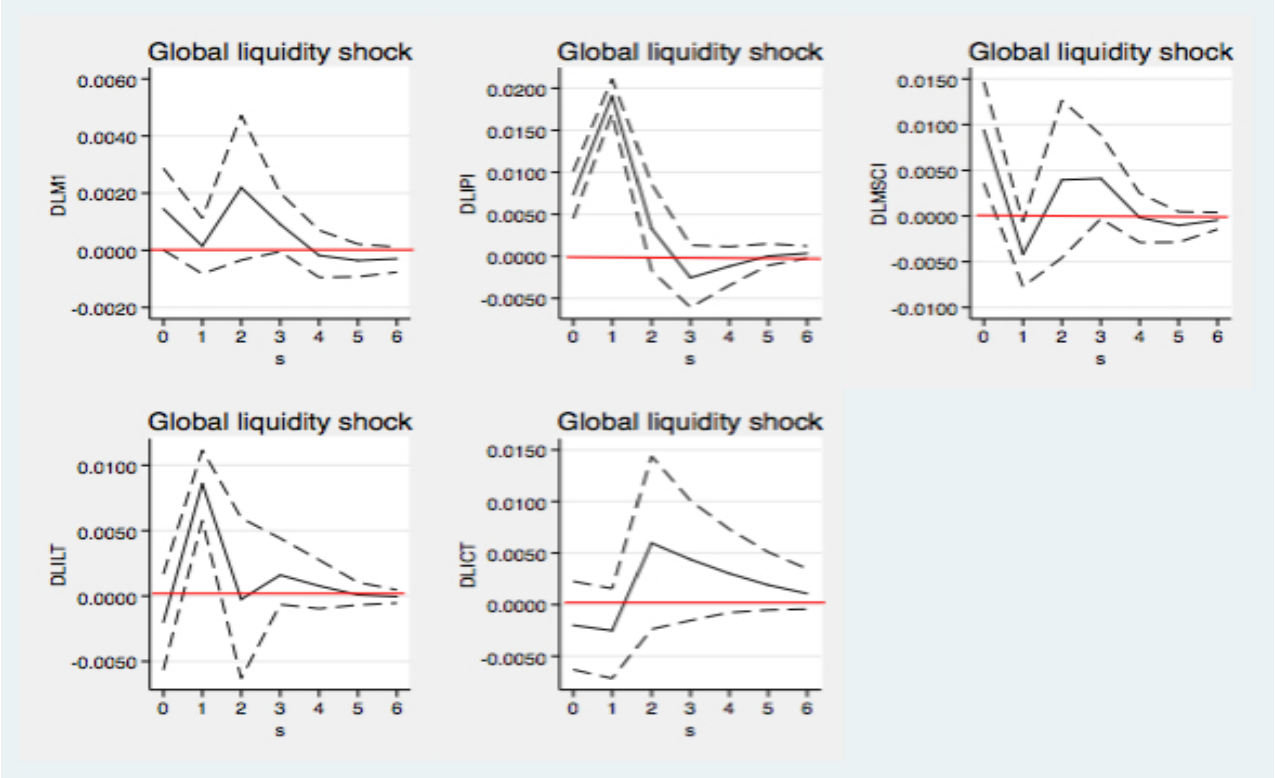


Figure 6: IRFs Africa and middle east

	1 months	3 months	6 months
M1	0.4	1.3	1.4
IPI	3.2	20.7	20.9
MSCI	1.2	1.6	1.8
ILT	0.1	2.6	2.7
ICT	0.1	0.8	1.2

Table 5: Variance decomposition

2. Fixed exchange rate model

a. Model using narrow money as monetary proxy

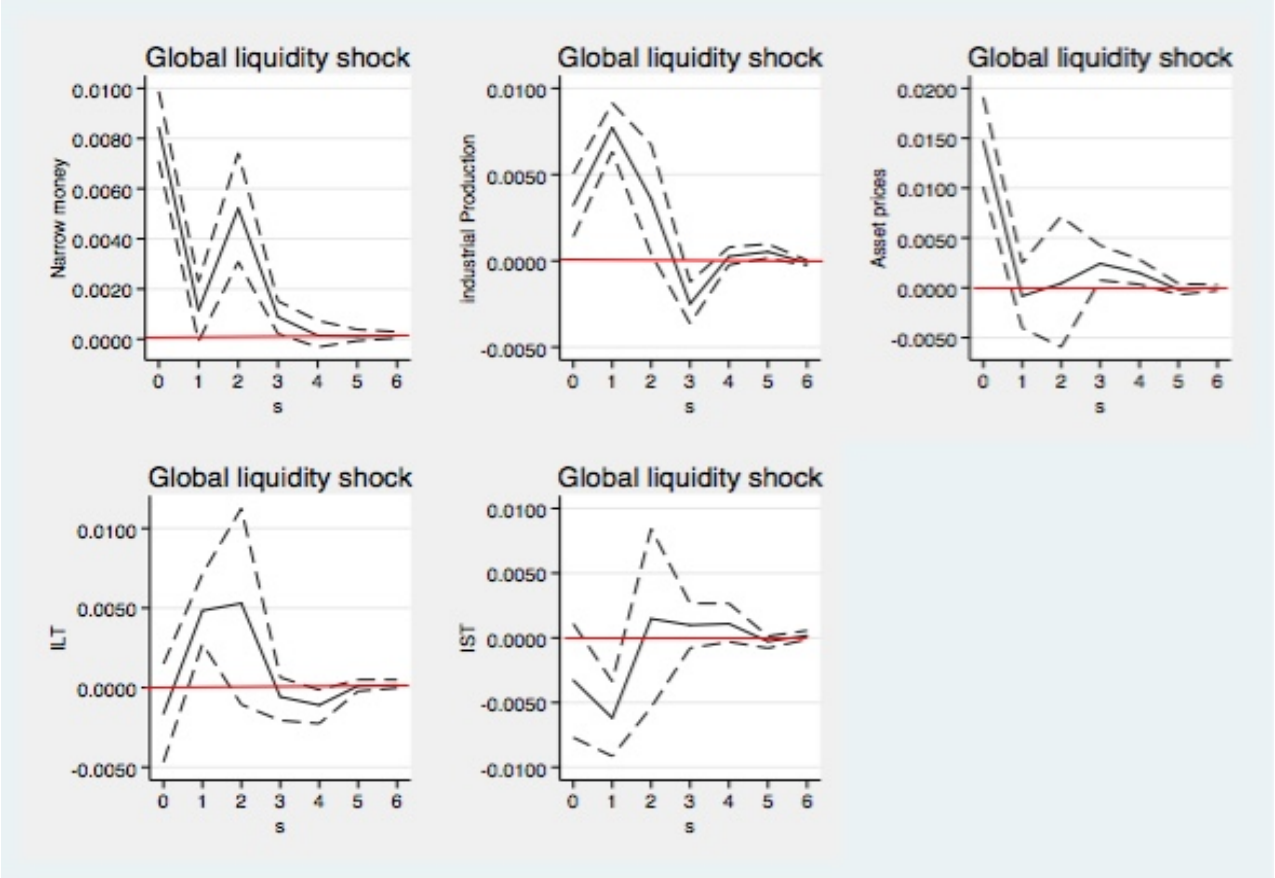


Figure 7: IRFs Fixed exchange rate model

	1 months	3 months	6 months
M1	5.7	7.6	7.7
IPI	0.5	3.7	4.05
MSCI	1.7	1.7	1.7
ILT	0.05	1.0	1.0
ICT	0.1	0.4	0.4

Table 6: Variance decomposition

b. Broad money as monetary proxy

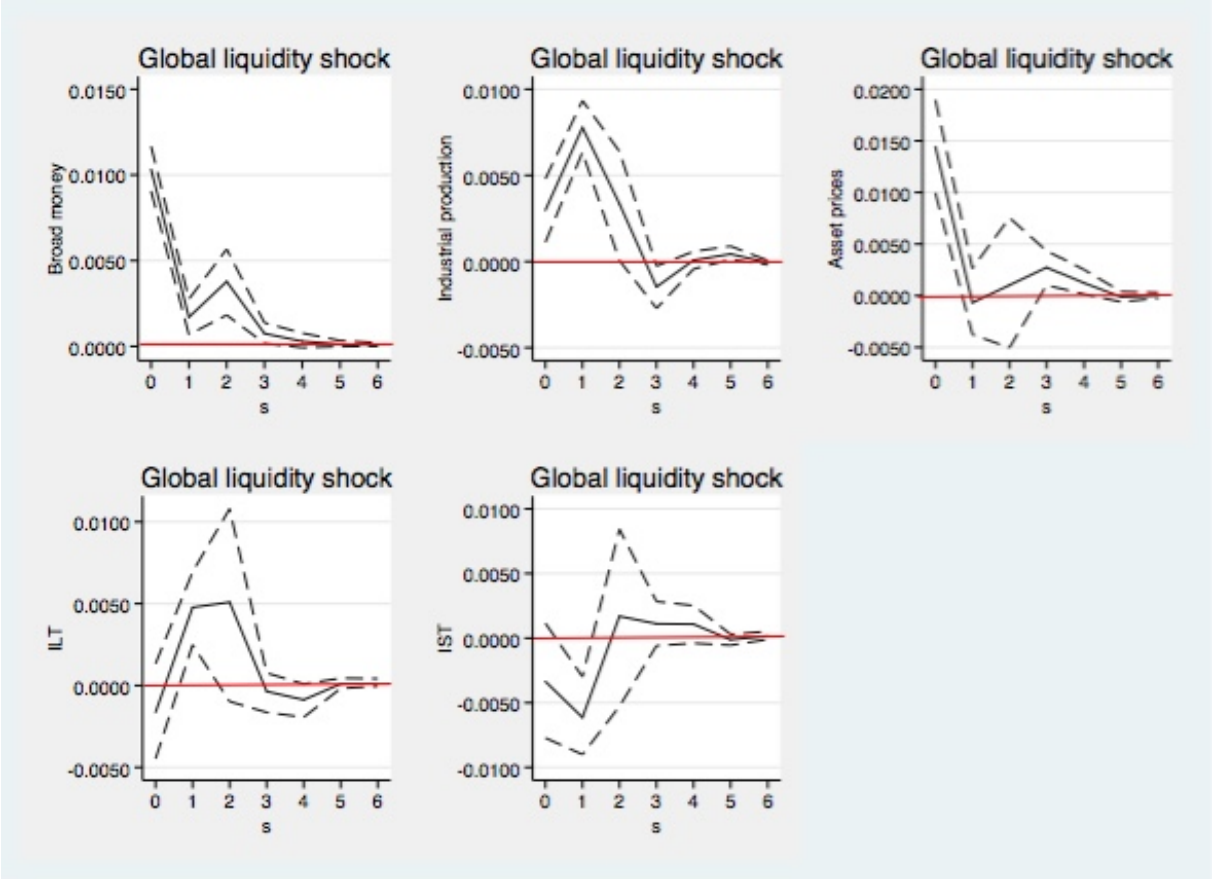


Figure 8: IRFs fixed exchange rate model

	1 months	3 months	6 months
M2	9.9	10.9	11
IPI	0.4	3.6	3.7
MSCI	1.7	1.7	1.7
ILT	0.05	0.9	0.9
ICT	0.1	0.4	0.5

Table 7: Variance decomposition

3. Floating exchange rate model

a. Model using narrow money as monetary proxy

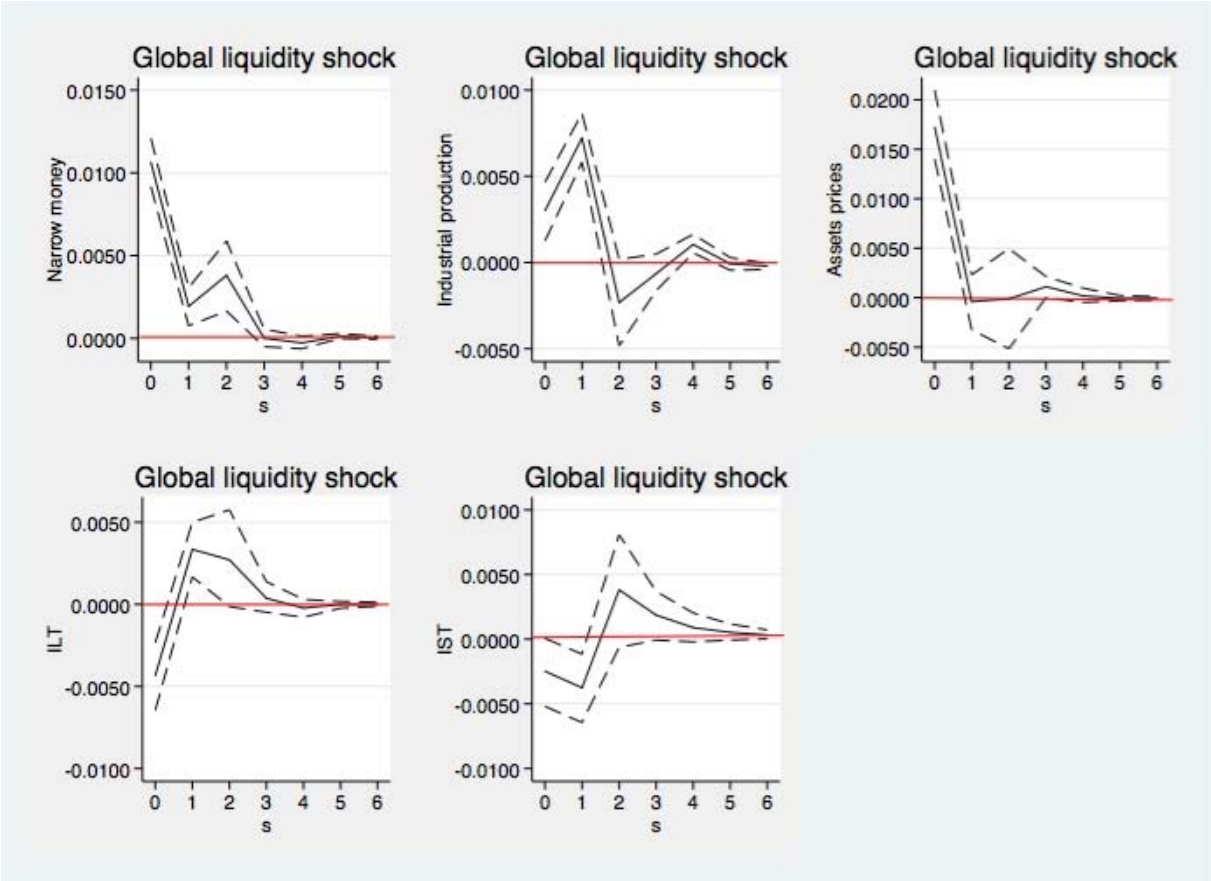


Figure 9: IRFs floating exchange rate model

	1 months	3 months	6 months
M1	6.7	7.5	7.5
IPI	0.4	2.5	2.5
MSCI	3.4	3.4	3.4
ILT	0.5	1.0	1.0
ICT	0.1	0.5	0.5

Table 8: Variance decomposition

b. Broad money as monetary proxy

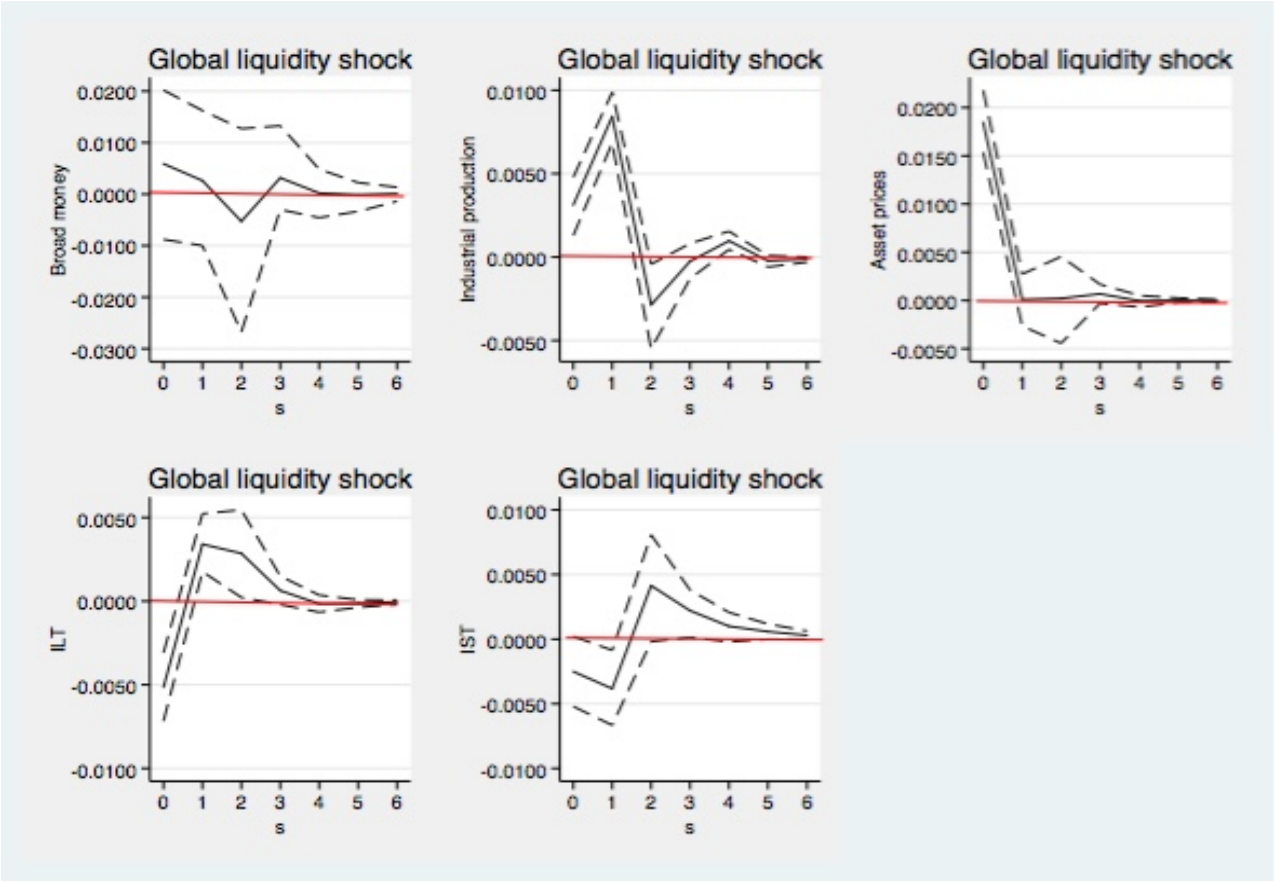
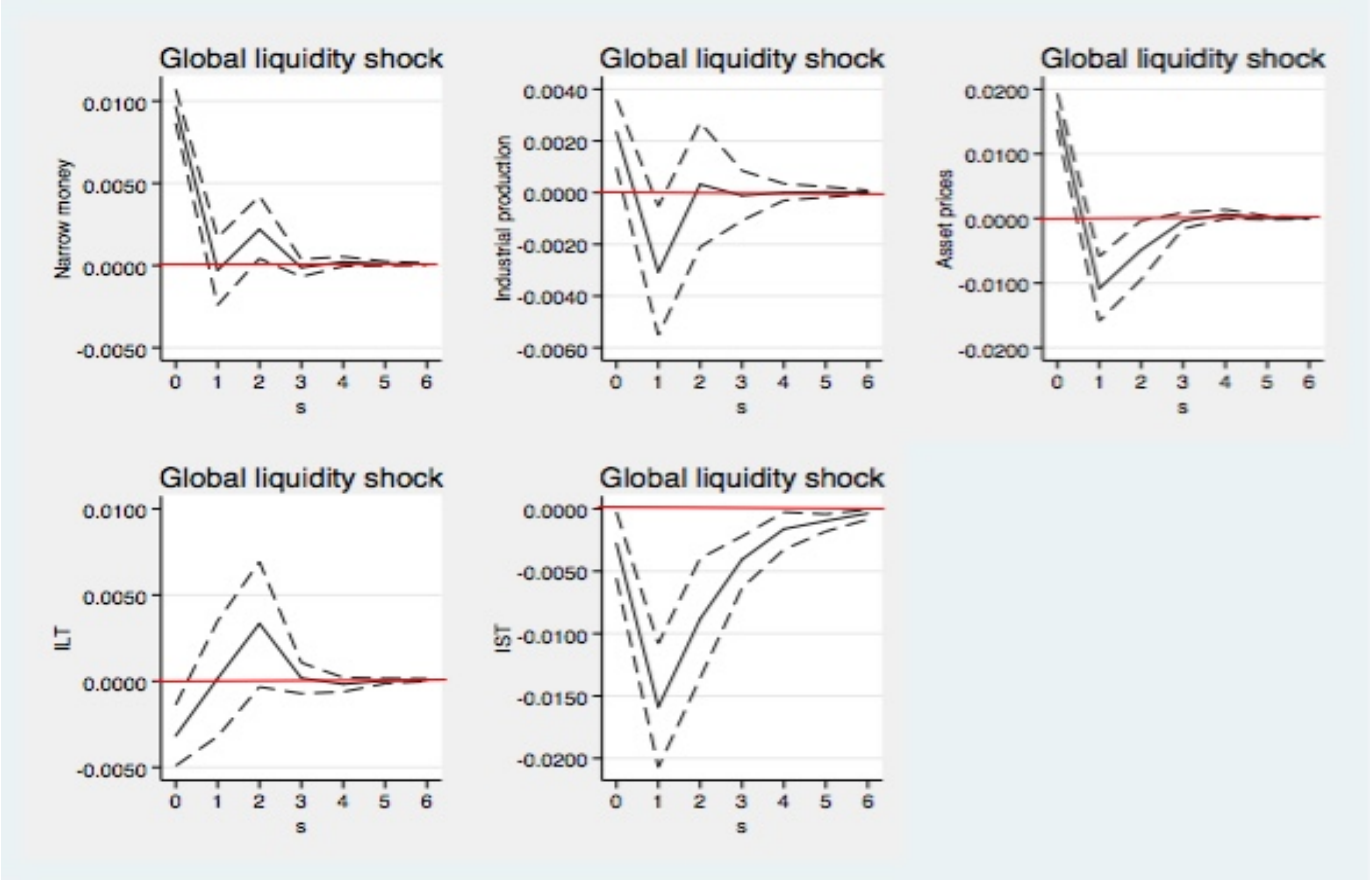


Figure 10: Floating exchange rate

	1 months	3 months	6 months
M2	0.02	0.04	0.04
IPI	0.4	3.0	3.3
MSCI	3.9	3.8	3.8
ILT	0.8	1.3	1.3
ICT	0.1	0.5	0.6

Table 9: Variance decomposition

4. Robustness test model



<u>Figure 11</u>: IRFs Global model new liquidity indicator

	1 months	3 months	6 months
M1	5.9	6.1	6.1
IPI	0.2	0.59	0.59
MSCI	2.5	3.7	3.7
ILT	0.2	0.4	0.4
ICT	0.09	3.7	3.9

<u>Table 10:</u> Variance decomposition

C. Panel non-causality test

1. Theoretical Framework

In order to identify the causal direction of the global liquidity transmission mechanism between our endogenous variables, we perform a panel non-causality test developed by Dumitrescu and Hurlin (2012). This procedure is an extension of the Granger (1969) test to heterogeneous panel data models. It preserves the heterogeneity of cross-sectional units; it allows us to test the direction of the relationship between macroeconomic imbalances without imposing the same dynamic model for all the countries of the sample. The procedure consist in estimating the following heterogeneous autoregressive model:

$$y_{i,t} = \theta_i + \sum_{k=1}^{K} \gamma_i^{(k)} y_{i,t-k} + \sum_{k=1}^{K} \delta_i^{(k)} x_{i,t-k} + \epsilon_{i,t}$$

Where *x* and *y* are two stationary variables, observed on *T* periods for *N* countries. The model assumed that individual effects are fixed and the lag-order *K* is supposed to be common for all the countries of our sample. $\gamma_i^{(k)}$represents the autoregressive parameters and $\delta_i^{(k)}$are the regression coefficients slopes; both parameters differing across countries. By definition, x causes y if and only if the past values of the variable x observed on the i^{th} country improve the forecasts of the variable y for this country i only. The null hypothesis is the homogeneous non-causality (HNC), i.e there is no causal relationship from *x*to *y* for all the countries of the panel ($\delta_i^{(i)} = \left(\delta_i^{(1)}, \dots, \delta_i^{(K)}\right)' = 0, \forall i = 1, \dots, N$) . Under the alternative hypothesis, there exists a causal relationship from *x*to *y* for at least one country of the sample. The test statistic is given by the cross-sectional average of individual Wald statistics defined for the granger non-causality hypothesis for each country (W_{HNC}) and converges to a chi-squared distribution wih *K* degrees of freedom. There are two standardized statistics have been defined by the authors: the first one is based on the exact asymptotic moments of the individual Wald statistics (Z_{HNC}) and the second one on approximated moments of finite T samples ($\tilde{Z}_{HNC}$). In practice, the authors showed that the standardized version of the Wald statistic, appropriately weighted in unbalanced panels, follows a standard normal distribution ($\bar{Z}_{HNC}$). The panel non-causality results are based on this alternative version of the Wald statistics that converges to a normal distribution. Furthermore, we perform the test with different lags as robustness check.

2. Panel non causality test results

Lag order	*Statistic tests*									
	W_{HNC}	$\bar{Z}_{HNC}$	W_{HNC}	$\bar{Z}_{HNC}$	W_{HNC}	$\bar{Z}_{HNC}$	W_{HNC}	$\bar{Z}_{HNC}$	W_{HNC}	$\bar{Z}_{HNC}$
	ILT to ICT		**ICT to ILT**		**IPI to ICT**		**ICT to IPI**		**M1 to ICT**	
k = 1	4.28	11.48*	1.62	2.12*	0.10	-3.25*	2.99	7.13*	7.74	24.18*
k = 2	4.10	5.06*	1.11	-2.32*	1.99	-0.09	4.87	7.19*	8.94	17.49*
	ICT to M1		**GL to ICT**		**ICT to GL**		**MSCI to ICT**		**ICT to MSCI**	
k = 1	1.56	1.98*	4.04	10.88*	2.37	4.88*	5.20	15.06*	0.96	-3.29*
k = 2	8.34	15.98*	2.36	0.84	2.05	0.08	5.52	8.84*	0.96	-2.67*
	IPI to ILT		**ILT to IPI**		**M1 to ILT**		**ILT to M1**		**GL to ILT**	
k = 1	0.29	-2.55*	0.47	-1.92	0.36	-2.33*	-2.33	1.21	0.70	-1.13
k = 2	8.36	15.72*	1.16	-2.18*	0.81	-3.04*	4.26	5.54*	0.66	-3.43*

	W_{HNC}	$\bar{Z}_{HNC}$	W_{HNC}	$\bar{Z}_{HNC}$	W_{HNC}	$\bar{Z}_{HNC}$	W_{HNC}	$\bar{Z}_{HNC}$	W_{HNC}	$\bar{Z}_{HNC}$
	ILT to GL		**MSCI to ILT**		**ILT to MSCI**		**M1 to IPI**		**IPI to M1**	
$k=1$	1.04	0.09	0.15	-3.06*	0.95	-0.23	0.68	-1.16	0.62	-1.38
$k=2$	1.83	-0.57	0.09	-4.83*	2.38	0.84	1.47	-1.39	17.66	39.63*
	GL to IPI		**IPI to GL**		**MSCI to IPI**		**IPI to MSCI**		**GL to M1**	
$k=1$	0.08	-3.34*	3.65	9.48*	0.04	-3.48*	0.05	-3.45*	1.06	0.20
$k=2$	3.78	4.46*	4.35	5.91*	3.70	4.26*	21.06	48.25*	2.27	0.63
	M1 to GL		**MSCI to M1**		**M1 to MSCI**		**MSCI to GL**		**GL to MSCI**	
$k=1$	8.08	28.02*	0.44	-2.03*	0.85	-0.57	1.21	0.71	1.64	2.25*
$k=2$	9.13	18.03*	0.41	-4.06*	4.31	5.70*	1.44	-1.48	3.44	3.58*

Note: "X" to "Y" means that we test the null hypothesis of homogenous non-causality (HNC) from X to Y

The sign * means the rejection of null hypothesis at 5% significance level

D. Panel Unit root test results

1. Benchmark model

Variable	IPS Test			
	Intercept		Intercept and trend	
	t-stat	p-value	t-stat	p-value
i_{ct}	-2.10**	0.017	-1.80**	0.03
Δi_{ct}	-46.85	0.00	-47.5***	0.00
i_{lt}	-3.32***	0.00	-3.41***	0.00
Δi_{lt}	-49.93***	0.00	-50.57	0.00
$OUTPUT$	-0.39	0.34	-1.058	0.14
$\Delta OUTPUT$	-46.4***	0.00	-47.58	0.00
$MSCI$	1.319	0.90	-0.72	0.23
$\Delta MSCI$	-57.67***	0.00	-59.78***	0.00
$M1$	4.99	1	-1.13	0.12
$\Delta M1$	-58.35***	0.00	-60.61	0.00
$M2$	5.73	1	0.663	0.74
$\Delta M2$	-62.14	0.00	-65.06	0.00
GL_index	0.68	0.75	18.73	1
ΔGL_index	-39.39***	0.00	-39.97***	0.00

Note: The signs ***, ** and * means respectively the rejection of null hypothesis at 1%, 5% and 10% significance level

The unit root tests are based on the unit root null hypothesis. We use first differences on the variables in levels to remove the unit root. We additionally differentiate our stationary variable in levels (i_{lt}, i_{st}) as the PVAR procedure requires first differences variables to remove the fixed effect and perform the OLS estimation.

The Im–Pesaran–Shin test (2003) is a panel unit root test that relaxes the assumption of a common autoregressive parameter inside the panel data. Moreover, the IPS tests are best suited for our unbalanced datacpset, as balanced dataset is not required to perform the Unit root procedure.

E. Alternative benchmark model impulses responses functions.

This alternative benchmark model use broad money as monetary proxy in the receiving economies. In this model, we find that the broad money is not sensible to global liquidity shock. It is the reason we choose the model using narrow money as monetary proxy in the receiving countries.

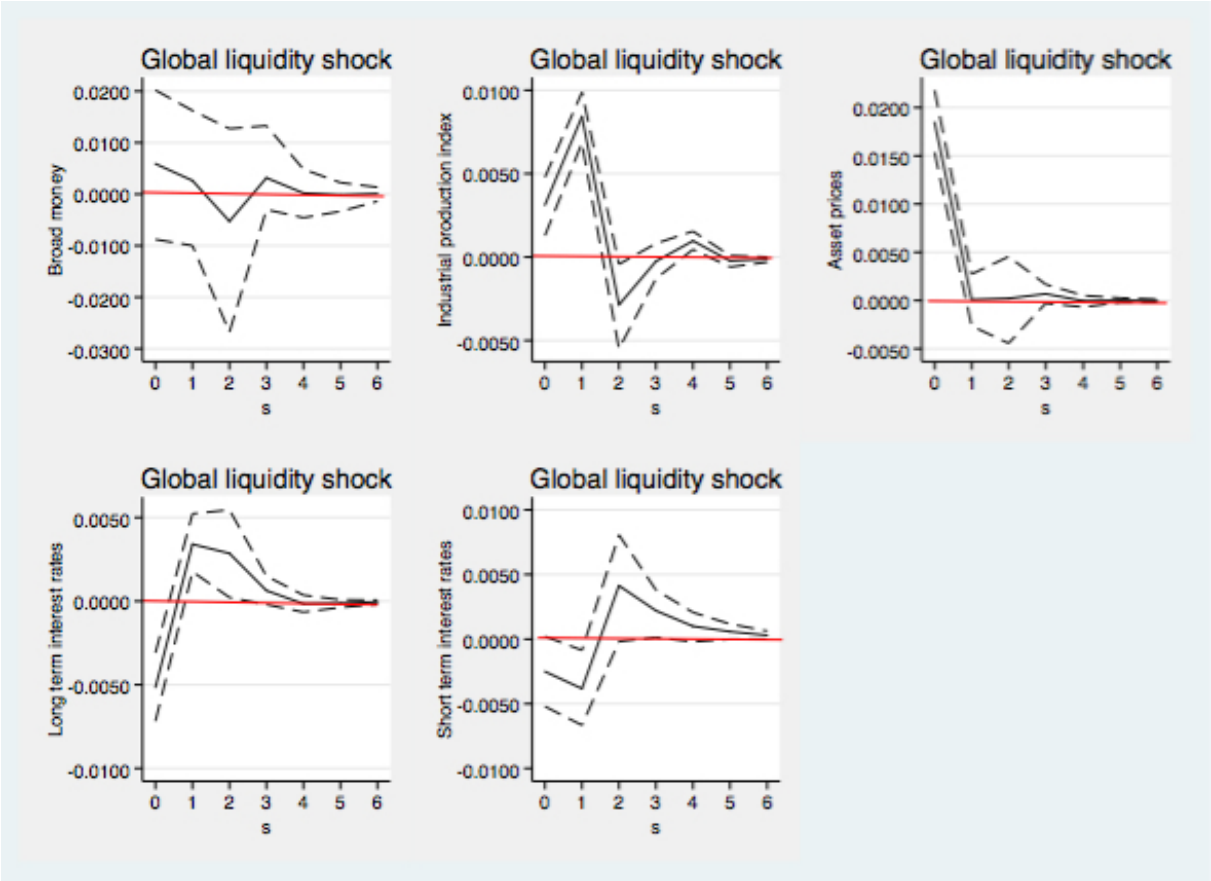


Figure 12: IRF's Global model using Broad money as proxy

F. Exchange rates regime classification

	Argentina	Australia	Bulgaria	Chile	China	Czech Rep.	Egypt	Hungary	India	Indonesia	Israel	Jordan	Korea
Median	2	4	1	3	1	3	2	2	2	3	3	1	3
Average	2.51	4	1	3	1.57	2.63	1.71	1.71	2	3	2,51	1	3
Exchange rate regime	Fixed	Floating	Fixe	Floating	Fixed	Floating	Fixed	Fixed	Fixed	Floating	Floating	Fixed	Floating

	Lithuania	Malaysia	Mexico	New Zealand	Peru	Philippines	Poland	Russia	Singapore	South Africa	Thailand	Colombia
Median	1	1	3	3	2	3	3	2	3	4	3	3
Average	1.61	1.51	3	3	2	2.29	3	2.11	3	4	3	3
Exchange rate regime	Fixed	Fixed	Floating	Floating	Fixed	Fixed	Fixed	Fixed	Floating	Floating	Floating	Floating

NB: Coarse classification codes

Code	1	2	3	4
Exchange rate regime	De facto peg	Crawling peg	Managed floating	Freely floating

This exchange rates regime distinction is based on the monthly coarse classification developed by Reinhart and Rogoff. Taiwan is the only country in our dataset not included in their classification. Considering the fact that Taiwan historically use managed crawling peg, we assume that they use fixed exchange rate regime during the period.